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THESIS

TOWARD JOINT MEDICAL LOGISTICS 2010 AND BEYOND: PROCESS INNOVATION AND REDESIGN OF CLASS VIII SUPPLY CHAIN AT A MEDICAL LOGISTICS COMPANY

by

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and
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December 2000

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The purpose of this thesis is to evaluate current Class VIII supply chain procedures at a U.S. Medical Logistics Company (Med Log Co), process map the "as is" baseline process and propose possible "to be" process redesign alternatives that will possibly improve efficiency and produce long-term cost savings. To perform this analysis, the 1st Med Log Co at Camp Pendleton, CA was chosen. The assessment of their "as is" process includes a historical background on medical logistics within the Department of Defense, a comprehensive material logistics literature review, site visits, personnel interviews, process mapping of the baseline "as is" process, and proposal of two redesign alternatives for the "to be" process. A comprehensive analysis was conducted using Thomas Davenport's Process Innovation Framework and quantitative measurements were obtained using the Knowledge-based Organizational Process Redesign (KOPeR) methodology to diagnosis existing pathologies. KOPeR measurements indicate that the 1st Med Log Co's existing "as is" process is a fragmented, mostly manual procurement process that can be innovated now using information technology as a process enabler. Our results indicate that by formally injecting the use of electronic mail and shared databases into the "as is" procurement process an immediate impact can be realized. Further efficiency and cost savings can be accomplished by coupling the injection of information technology with a web-based end-to-end procurement process that assigns a case manager to the "to be" process.

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TOWARD JOINT MEDICAL LOGISTICS 2010 AND BEYOND: PROCESS INNOVATION AND REDESIGN OF CLASS VIII SUPPLY CHAIN AT A MEDICAL LOGISTICS COMPANY

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ABSTRACT

The purpose of this thesis is to evaluate current Class VIII supply chain procedures at a U.S. Medical Logistics Company (Med Log Co), process map the "as is" baseline process and propose possible "to be" process redesign alternatives that will possibly improve efficiency and produce long-term cost savings. To perform this analysis, the 1st Med Log Co at Camp Pendleton, CA was chosen. The assessment of their "as is" process includes a historical background on medical logistics within the Department of Defense, a comprehensive material logistics literature review, site visits, personnel interviews, process mapping of the baseline "as is" process, and proposal of two redesign alternatives for the "to be" process. A comprehensive analysis was conducted using Thomas Davenport's Process Innovation Framework and quantitative measurements were obtained using the Knowledge-based Organizational Process Redesign (KOPeR) methodology to diagnosis existing pathologies. KOPeR measurements indicate that the 1st Med Log Co's existing "as is" process is a fragmented, mostly manual procurement process that can be innovated now using information technology as a process enabler. Our results indicate that by formally injecting the use of electronic mail and shared databases into the "as is" procurement process an immediate impact can be realized. Further efficiency and cost savings can be accomplished by coupling the injection of information technology with a web-based end-to-end procurement process that assigns a case manager to the "to be" process.

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LIST OF ACRONYMS AND ABBREVIATIONS

act	Action
ADAL	Authorized Dental Allowance List
Add	Additional
A-digraph	Attributed digraph
AHRMM	Association for Healthcare Resource and Material Management
AI	Artificial Intelligence
AIT	Automated Identification Technology
AMMAL	Authorized Minimum Medical Allowance List
Ammo	Ammunition
Apprv	Approval/Approved
ASPs	Application Service Providers
ATLASS	Asset Tracking For Logistics and Supply System
B2B	Business-to-Business
Bil	Bill
BM	Block Manager
Bn	Battalion
BPR	Business Process Re-engineering
BUMED	Bureau of Medicine and Surgery
BW	Bulk Warehouse
C & P	Contracting & Purchasing
CINC	Commander in Chief
CO	Commanding Officer
Co	Company
Convert	Converted
Cust	Customer
CW	Contingency Warehouse
DD	Department of Defense
DMLSS	Defense Medical Logistics Standard Support
DoD	Department of Defense
DoN	Department of the Navy
DS/DS	Desert Shield/Desert Storm
DSCP	Defense Supply Center Philadelphia
ECAT	Electronic Catalog
EDI	Electronic Data Interchange

E-mail	Electronic Mail
E-commerce	Electronic Commerce
E-business	Electronic Business
Engr	Engineering
ESOC	Emergency Supply Operations Center
FSS	Federal Supply System
FSSG	Force Service and Support Group
Fwd	Forward
FY	Fiscal Year
Gen	Generation
H & S	Headquarters and Service
HA	Health Affairs
hd	Head
HSSO	Health Service Support Office
ID	Identification
IML	Integrated Medical Logistics
IT	Information Technology
JCS	Joint Chiefs of Staff
JML	Joint Medical Logistics
KOPeR	Knowledge-based Organizational Process Redesign
LAN	Local Area Network
Ldg	Landing
LIDS	Laboratory Identification Data System
LTI	Limited Technical Inspection
LTR	Letter
MAGTF	Marine Air-Ground Task Force
Main	Maintenance
Med Log Co(s)	Medical Logistics Company/Companies
Med/Surg	Medical/Surgical
MEF	Marine Expeditionary Force
MOOTW	Major Operations Other Than War
MRO	Material Release Order
MTW	Major Theater War
MT	Motor Transport
NA	Not Applicable
OP	Open Purchase
PC	Procurement Clerk
Pharm	Pharmaceutical

Proc	Processed
PS	Procurement Section
PV	Prime Vendor
PVMS	Prime Vendor Medical/Surgical
PVP	Prime Vendor Pharmacy
Replen	Replenishment
Req	Requirement(s)
Resech	Research
Rev	Review
SASSY	Supported Activities Supply System
Sch	Schedule(d)
Sec	Section
Serv	Service
SOS	Source of Supply
Spt	Support
Sup	Supply
Tele	Telephone
TRC	Technical Review Clerk
USD	Under Secretary of Defense
Val	Validate/Validation
Ver	Verify/verification
VMI	Vendor Managed Inventory
WM	Warehouseman
WS	Warehouse Section

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I. INTRODUCTION

A. PURPOSE

This thesis addresses problems and limitations in the current ordering processes of medical supplies within a Medical Logistics Company (Med Log Co) of a U.S. Marine Corps Supply Battalion (Bn) and explores methods of improvement using a process innovation approach. The main emphasis of this thesis is to analyze the medical procurement processes within a Med Log Co for process innovation and to further describe enablers and inhibitors of innovation in the Department of Defense (DoD) medical procurement process.

B. BACKGROUND

The history of medical material management in the United States Navy dates back to 1850. From 1853 through 1941, the Navy Department actually produced medical supplies for use within the Medical Department of the Navy. Today, we find the Department utilizing methods such as Prime Vendor (PV) and Vendor Managed Inventory (VMI) to provide needed medical supplies at a competitive price. This step has certainly led to great improvement, but we have to ask, has PV and VMI taken the medical procurement processes far enough in the areas of streamlined processing and improved efficiencies?

A decade ago, business efficiency was not the highest priority in the Department of the Navy (DoN), but the situation is changing. Although DoD does not have a profit motive or compete for market share, its business functions are very similar to those in the private sector and severe budget constraints associated with the draw down following the Cold War has dramatically raised the priority level of Navy business efficiency. The gap

between DoD and private sector business practices has become increasingly obvious. [Ref. 1]

Today, it is clear that by improving our business practices, we can get more military capability out of increasingly limited resources. [Ref. 2] The *Strategic Sourcing Program* initiatives extol the virtues of Business Process Reengineering (BPR), having Department business units researching and adopting some of similar industries' best practices and striving for dramatic performance improvement. [Ref. 1] There is nothing to stop even an inherently governmental operation from adopting commercial industries best practices.

The goal of *Strategic Sourcing* is to determine whether processes can be eliminated, improved or streamlined, while achieving program objectives with the optimum balance between program performance and costs. The focus of this thesis is to look at the benefits that a Medical Logistics Company (Med Log Co) has observed with the implementation of PV and VMI, examine subsequent savings and determine if the process has met its objective of making the procurement of medical supplies more efficient.

This thesis also looks at the emerging processes in the private sector to determine if innovations can be made to further streamline the process. Most notable is the emergence of web-based procurement. The Internet is changing how companies do their buying. Forrester Research estimates that the electronic commerce (e-commerce) market for medical supplies will grow tremendously from 1999 to 2004; however, this market is grossly inefficient. The standard hospital procures millions of dollars in goods a year

from a fragmented field of more than 22,000 suppliers who sell face-to-face or through a software platform incompatible with many hospital legacy systems. Most transactions are done on paper and stored in file cabinets, which can lead to vast price differences and processing fees that cost the industry approximately $23 billion a year. [Ref. 2]

Purchasing medical supplies online is not really about buying them at a lower price as much as it is about buying them at a lower cost. Can a Med Log Co utilize web-based procurement as an enabler of process innovation? Online procurement is the next frontier for innovative material managers and it is one of the hottest areas for potential cost savings. Managers can either use web-based procurement to their advantage or take a wait-and-see approach. Of the estimated $83 billion that hospitals spend annually on supplies and equipment, it is estimated that as much as $11 billion could be eliminated by improving procurement practices. [Ref. 3]

An online scorecard, which tracks the number of health care e-commerce sites, grew from 36 on 29 February 2000 to 54 sites on 16 May 2000. Focusing on sites that are targeting the business-to-hospital sector, four major players emerge: Neoforma.com, Medibuy.com, Broadlane.com, and Empacthealth.com. The authors corresponded with these companies, requesting information on their business and how they could assist a Med Log Co in improving its business practices through the utilization of web-based procurement practices. At the time that this research was conducted one company, Medibuy.com, based in San Diego, California responded.

The authors conducted an initial interview with the managing director of government accounts, Mr. G. Mike Johnson and he graciously agreed to assist us in any

way that he can. For this reason, we focused our web-based procurement concept using Medibuy.com as the model for a Med Log Co to use. Through a benchmarking case study analysis, we seek to identify those best practices from the commercial sector offering good potential for adaptation to the DoD. In parallel with this benchmarking analysis, we also employ a deductive approach to process innovation, using a top-down framework for identifying promising redesign alternatives, that can yield dramatic improvements, in conjunction with adaptation of commercial best practices as above. Finally, where such potential innovations look promising, the thesis identifies how they can be applied to other Services and agencies.

C. RESEARCH QUESTIONS

1. Primary Research Question

How can the procurement of medical supplies within a Med Log Co be innovated with the goal of improving performance?

2. Secondary Research Questions:

- What processes of the Med Log Co offer the best potential for performance improvement?
- What technologies can be employed to innovate the medical supply chain management process?
- What behaviors, if any, need to be modified to accept changing supply chain management methodologies?
- How can the medical logistics community implement the new process?
- How can this research be generalized to other key processes and organizations?

D. METHODOLOGY

The methodology of this thesis is twofold. As one approach, we perform a benchmarking case study and seek to adapt best commercial practices to the DoD. To complement this approach, we also use a deductive method that employs Thomas Davenport's Process Innovation Framework to analyze the medical procurement processes. Through these combined approaches, we seek to suggest ways to dramatically improve the processes and determine if any of those improvements can be applied to other Services and agencies.

Data are collected from three sources. The first involves an extensive literature review on supply procurement processes and process innovation. This literature review provides the researchers with background on current policies and practices to gain a better understanding of the process innovation approach and determine the benefits and limitations of the current medical procurement processes.

The second data collection method involves in-depth discussions and document analysis with Medibuy.com. This provides the basis for benchmarking as outlined above.

The third data collection method focuses on site visits and interviews/surveys with individuals in the medical procurement process at the Naval Medical Logistics Command (NMLC), Headquarters, U.S. Marine Corps, Marine Corps Logistics Bases, Force Service and Support Group (FSSG), and at the three Med Log Cos. A primary focus for these interviews was to gather data and personal views regarding the benefits and limitations of the current medical procurement processes as they affect their areas and explore recommendations for improvements. Additionally, the interviews focused on

the views of key individuals in the medical procurement processes to determine the boundaries of the program and where those boundaries can be eliminated or relaxed.

E. SCOPE OF THESIS

The audience for this thesis includes DoD policy makers, NMLC personnel, and Marine Corps Supply Battalion personnel. This thesis addresses problems and limitations with the current medical procurement process and explores methods for improvement using a process innovation approach. The main emphasis of this thesis is to analyze the medical procurement processes for process innovation and to further describe enablers and inhibitors of innovation in the DoD medical procurement processes. This thesis is focused on investigating the procurement of medical supplies in a U.S. Marine Corps Med Log Co, but it also attempts to generalize the results to other Services and agencies that procure medical material.

F. ORGANIZATION

Following the thesis introduction in this chapter, Chapter II discusses the background of medical procurement processes, outlines current medical procurement processes and its limitations as well as the benefits the Marine Corps has seen since its implementation. It also summarizes Thomas Davenport's methodology for process innovation.

In Chapter III, data gathered from an extensive literature review are used to survey the background and medical supply procurement policies and practices to determine the benefits and limitations of the current processes. Secondly, the chapter presents data from site visits and interviews/surveys conducted with individuals who procure medical supplies at the Med Log Co level. Lastly, the data collected are

consolidated into a comparative analysis using Thomas Davenport's model to identify possible enablers of process innovation.

Chapter IV analyzes the positive implications and inhibitors of the medical procurement processes. The methods to overcome those inhibitors are then outlined. From the enablers identified to streamline the medical procurement processes, a redesign procedure is outlined. Conclusions are then made describing the potential success or failure of the redesigned medical procurement process.

Chapter V summarizes the conclusions made, makes recommendations for future innovations of medical procurement processes, and identifies areas for future research.

G. BENEFITS OF STUDY

The current medical procurement processes have produced some efficiencies and cost savings since their implementation. Despite this initial success, it may be possible to innovate the process further and dramatically improve the efficiency and savings to DoD. However, it is not immediately clear how such innovation could be effected. This thesis explores this issue using a structured approach to process innovation and intends to answer this important question.

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II. BACKGROUND

A. INTRODUCTION

The primary mission of the medical departments for all military services is promoting readiness for war. Within the Marine Corps, the Battalion Surgeon is tasked with maintaining the health and readiness of the individual Marines assigned to the battalion in garrison or during conflicts. An integral portion of maintaining that health is being assured that a deploying unit's medical assets will have the proper medical materiel when needed. Through medical planning provided by the Health Service Support Office (HSSO), the Battalion Surgeon must decide what materiel is needed for each contingency operation. Care must be taken not to build a fully functioning medical facility in a forward combat zone yet still provide the needed medical treatment in a quick responsive manner. In today's environment, if a deploying medical unit has a large logistical footprint, it will have to depend heavily on the logistical system to maintain its forward presence.

This chapter provides a history of medical logistics in the context of a medical logistics company. Next, a baseline ordering process is explained for further examination. Following this background information, the process innovation methodology developed by Thomas Davenport [Ref. 4] is defined to lay the foundation for our process innovation surrounding a medical logistics company. The concept of knowledge-based organizational process redesign (KOPeR) is used to suggest possible process redesigns using the existing infrastructure of a medical logistics company.

B. MEDICAL LOGISTICS

Medical logistics within the context of the DoD has become a program of enormous proportions and a costly endeavor to maintain at a high state of readiness. Within the DoN, medical logistics is concerned with providing logistical support to both fixed medical facilities (such as clinics and hospitals) and for operational units (such as ships and deploying units) with organic medical assets. Medical logisticians serving at either fixed facilities or with deploying units are said to serve two masters; one within the Bureau of Medicine and Surgery (BUMED) and a respective supply chain of command (either Naval Supply Systems Command, NMLC, or U.S. Marine Corps Logistics Command) depending upon the type of operational command. Each system is sufficiently distinct to warrant specialized training to ensure that logisticians are able to function.

1. Overview

A key definition of military logistics that it allows for assets to be acquired, forces to be sustained, assets to be distributed in a timely manner, and also allows for proper disposal. [Ref. 5] From this, the definitions for sustainment and distribution need to be explored. Sustainment includes the idea that adequate logistics support is available to allow for continuous operations with minimal interruptions. Distribution is the allocation and delivery of goods in a manner that will allow for maximum combat effectiveness using strategic transportation.

The current military logistics system does not fully support any of the above definitions, which causes leaders to realize that it needs to change. In the past, medical logistics has been controlled primarily through the federal supply system at the depot

level. End-users submitting requisitions were at the mercy of an archaic system that was implemented to increase the amount of standardization amongst the services. This system drove up inventory costs and provided minimal standardization among product lines or products.

DoD inventory management initiatives and efforts were geared toward ensuring that there was enough war-reserve materiel available should the Cold War become a reality. Within this system, medical materiel was a large cost because of perishable shelf-life material, associated pharmaceutical costs, and the concept of using assemblages (termed blocks) to provide initial supplies for operational units. Meanwhile, the system and its contents were not properly tested in an operational setting.

End-users accepted sub-quality materiel and lengthy delays in order-ship time. Lead times were computed at an aggregate vice end-user level, which contributed to the eventual stockpile of excess inventory at a great cost. In 1991, the events that surrounded Operations Desert Shield/Desert Storm (DS/DS) significantly changed the manner in which medical logistics and joint operations would occur in the future. [Ref. 6]

Before this conflict, the services were not used to operating within a joint environment, let alone having to communicate with each other during a live event. During the conflict, many problems arose in the healthcare arena, where two field hospitals could not communicate or share resources because each service had its own automated information legacy system and patient care technologies that could not be interchanged.

Since this conflict, the services have undertaken numerous changes to improve the health care delivery system, its inherent logistics, and joint capabilities. Many of these changes were internally driven and others were legislatively required. An initial change was to create an Under Secretary of Defense (USD) for Health Affairs (HA) to establish a joint service base for the delivery of health care.

Initiatives to reduce the medical inventory held within DoD include PV, initially implemented for pharmaceuticals and medical/surgical products and whose goal was to reduce depot level holdings, and VMI. All have enabled overall inventory levels to be reduced. Depot level stocks still exist specifically for military unique antidotes, specific vaccines, and Schedule II narcotics for shipment to operational units and facilities outside the United States. These stocks will always be in existence due to their nature or statutory requirements.

These initiatives also marked the beginning of a new era in medical supply chain management. Since there has been a draw down of depot level stocks, many outside the medical community, namely those at the Commander in Chief (CINC) level, do not have confidence in the sustainment capability and surge capacity for class VIII medical materiel during major theater war (MTW) or major operations other than war (MOOTW). To date, a comprehensive acquisition strategy has not been developed to show how sustainment can be achieved in either MTW or MOOTW. Primary areas of concern are with a deploying unit's ability to properly initially outfit, requisition, transport, distribute, verify billing, and make final payment for orders received.

A major problem noted during DS/DS was that there was a consistent lack of standardization between medical units and the services. [Ref. 7] This presented problems when units could not order, borrow or exchange materiel beyond basic consumables. Joint standardization initiatives are constantly being examined to ensure that in our rapidly changing world assemblages remain standard to decrease this problem for future operations. Another item of note is that the current medical logistics footprint for one 500-bed fleet hospital is significant because it was designed and equipped according to Cold War/Vietnam era medical practices. [Ref. 8] The standard fleet hospital had not undergone major changes to stay in concert with today's technology.

a. Joint Vision 2010

The implementation of *Joint Vision 2010* (now *Joint Vision 2020*) and the concept of *Focused Logistics* by the Joint Chiefs of Staff (JCS) were also initiated shortly after the creation of USD HA. It was noted that there is no current doctrine for joint medical logistics (JML) command and control in this new environment. Due to lessons learned during DS/DS, a requirement emerged for end-user access to information about outstanding requisitions and to gain better asset visibility. The explosion of the information technology industry has helped to spur initiatives such as total asset visibility.

The concept of *Focused Logistics* requires that our logistical resources must be capable of being responsive, flexible, and precise. [Ref. 9] The military services must be able to integrate information, logistical, and transportation technologies to provide rapid crisis response, track and shift assets even while they are enroute, and

deliver tailored logistical packages for sustainment purposes during MTW or MOOTW. [Ref. 10]

Precision Logistics is a Marine Corps management program focused on enhancing logistical capabilities with regard to operational maneuver from the sea. It is aimed at improving the effectiveness and efficiency of Marine Corps logistical processes. As a concept, *Precision Logistics* seeks to eliminate sources of delay and errors, and to increase reliability of the system, ensuring that the Marines will receive support when and where it is needed.

To operate in the battle space of the future, troops need to be lighter, flexible, and responsive in order to meet stated objectives. Supply, maintenance, transportation, engineering, health services, and other logistical services (including areas such as mortuary services, morale, welfare and recreation) comprise the six major functional areas to be considered as a part of *Precision Logistics*. Further, the JCS has mandated that every service member must embrace the primary logistical principles of responsiveness, simplicity, flexibility, economy, attainability, sustainability, and survivability, not just those individuals within the field of logistics.

b. Integrated Medical Logistics (IML)

By the year 2010, war-reserve materiel will be properly sized, positioned, prepackaged, and capable of being transported based on contingency operations, for either MTWs or MOOTWs. In addition, by that time, joint medical logistical functions should be fully integrated with the private sector. [Ref. 11]

Further, JCS's JML office has begun a program to ensure total IML will not be a passing fancy, but a concept that will remain into the 22nd century. Since the end of the Cold War, efforts have been undertaken at the JCS level to decrease the military's overall footprint, with regard to personnel, assets, and logistics. JML is also attempting to realign the existing infrastructure and modernize existing equipment/technology. Many of the current assemblages are pre-Vietnam era, and although the equipment will function technically, personnel using this equipment have little or no training on this obsolete equipment. The costs to replace or train personnel accordingly are both excessive. One of the key IML working groups is focusing on this issue and how best to overcome or reduce costs to solve it. [Ref. 11]

Peacekeeping and humanitarian missions, the definition of MOOTW scenarios, require a different type of medicine than what is needed for combat casualty care. Medical care and treatment may deal more with preventive medicine than care for traumatic injuries. The exact mix is not known. Each MTW and MOOTW is seen as an individual, separate event, one for which you can pre-plan, but operational units must still have the ability to remain flexible to support troops once forces are ordered into a theater of operations.

Basic assemblages must be reconfigured to provide warfighters with the materiel needed to ensure mission success with minimal logistical cost. The ability to move quickly is also a key issue to how the assemblages can be configured to reduce the overall footprint, yet provide full capability until a functioning supply chain is established along littoral lines or in theater. Options for re-supply include improving existing

capability, returning to a form of depot level re-supply, contracted logistics support within theater, and the use of third party logistics providers.

c. Fixed vs Operational Medical Facilities

Fixed medical facilities operate within a stable environment and lend themselves well to process improvements or innovations during peacetime or contingency periods. As stated above, DS/DS resulted in numerous improvements in the way that medical logisticians performed their daily tasks.

Automation through information systems was instituted at a rapid pace and with success. Most notable is the success of PV, which caused logistical response time to decrease from, greater than 30 days with depot level stocks to less than 48 hours with PV. Total PV sales for fiscal year (FY) 1999 were near $1.5 billion for pharmaceuticals, medical and surgical products, equipment, and readiness materiel. Depot level stocks have also been reduced due to increased reliance on initiatives such as PV and VMI. [Ref. 12]

Conversely, operational/deployable units do not have the same stability when deployed as that experienced in garrison. BUMED maintains 264 authorized minimum medical allowance lists (AMMALs) and authorized dental allowance lists for deployment with medical assets for these forces. In theory, they resemble Consolidated Outfitting Supply Allowance Lists that are issued for shipboard use. These AMMALs are assembled and configured for platforms such as the Fleet Marine Force or naval vessels. Recent fleet PV initiatives have been instituted within both the Navy and Marine Corps to reduce the overall logistics response time and improve the capability of a unit to receive their needed supplies.

2. Med Log Co

A part of the Supply Battalion of the FSSG include three separate Med Log Cos within the Marine Corps tasked with providing initial supply, re-supply, and sustainment for Marine Air-Ground Task Force (MAGTF) operations. Each company acts as a central focal point to receive, store, maintain, and issue Class VIII medical materiel to requesting deployable units using separate methodologies. For the purposes of this study, the 1st Med Log Co, 1st Supply Battalion, 1st FSSG [Figure 2.1] located at the U.S. Marine Corps Base Camp Pendleton is used to model the processes employed to procure medical materiel. A baseline "as is" process is established and examined to ascertain if a process innovation would improve the overall procurement process.

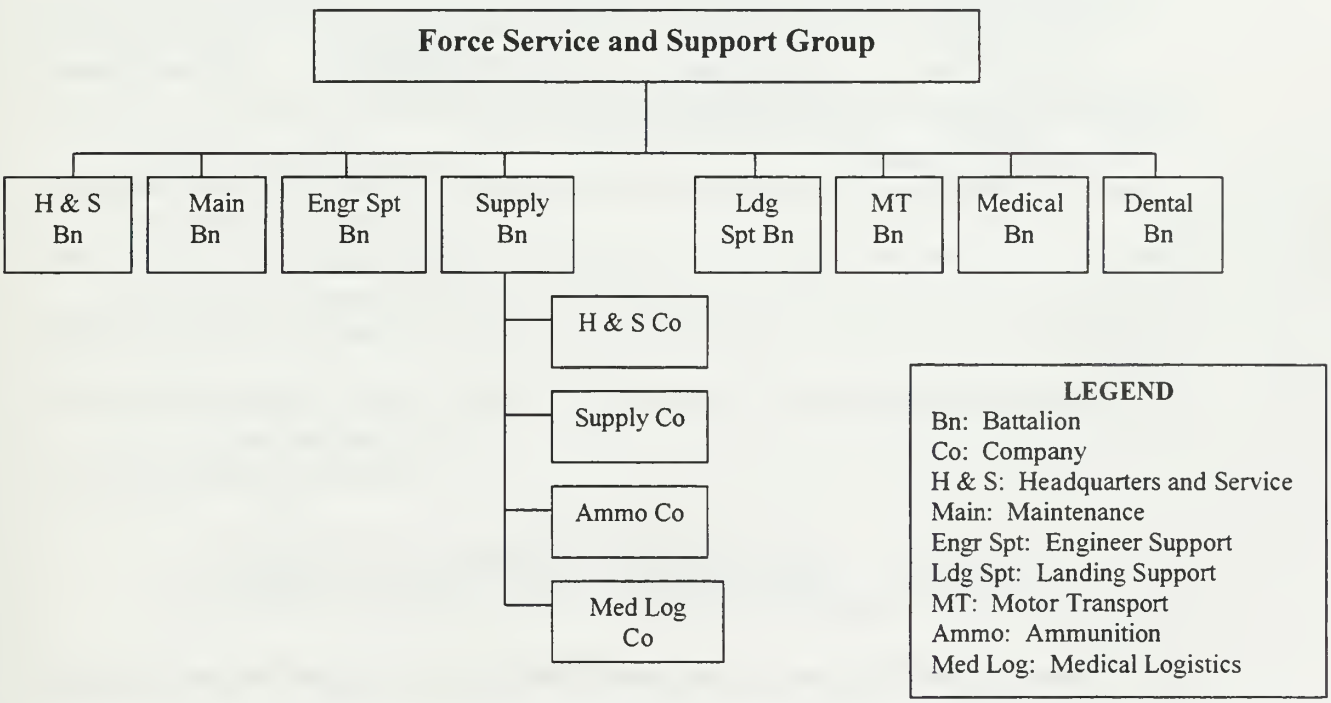

Figure 2.1. Organizational Structure FSSG. [Ref. 13]

The 1st Med Log Co [Figure 2.2] is comprised of an Administrative Section and three platoons which are the Contingency Warehouse (1st Platoon), Bulk Warehouse (2nd Platoon) and Medical Repair (3rd Platoon.) Their primary mission is to provide an initial outfitting of medical and dental materiel that will last for 15 days for deploying 1st Marine Expeditionary Forces (I MEF).

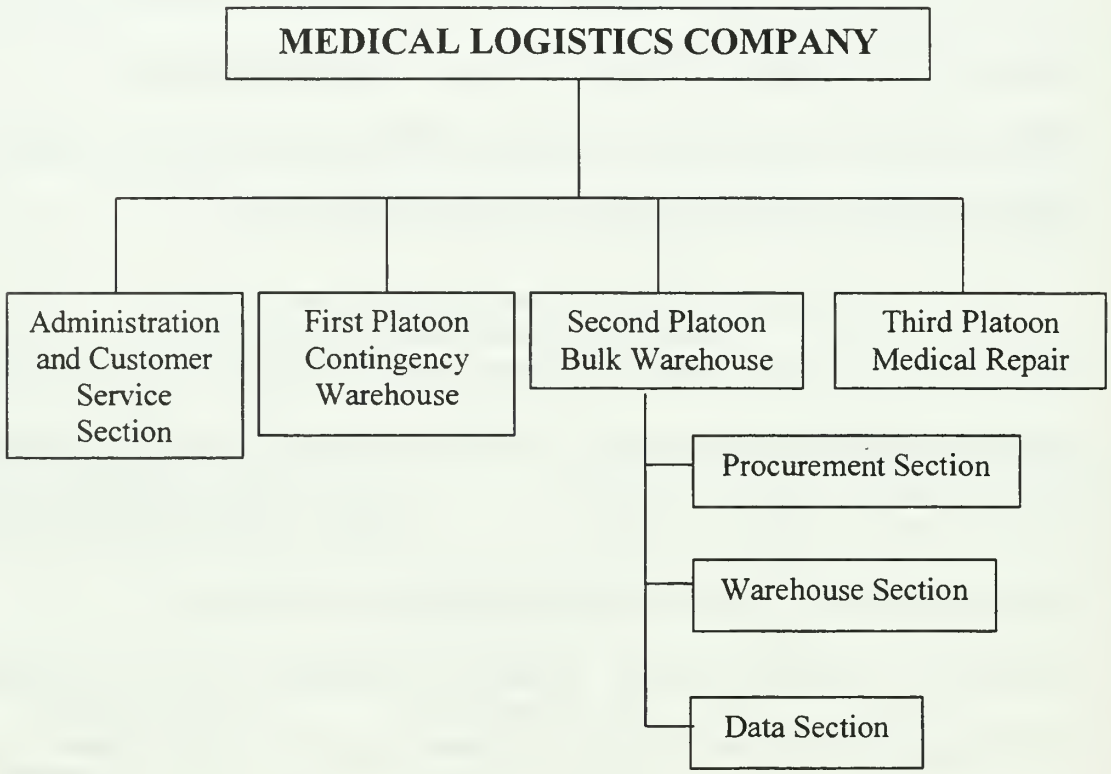

Figure 2.2. Organizational Structure 1st Med Log Co. [Ref. 13]

Following the initial deployment, the 1st Med Log Co is tasked with providing and maintaining enough stores to perform re-supply for up to 30 days. [Ref. 13] The entire process of ordering, receiving, and issuing specialized medical materiel assemblages (referred to as 'AMMAL blocks') centers on actions undertaken by the 1st and 2nd

Platoons. This study does not examine any processes used by the 3rd Platoon, whose role is maintenance of medical equipment.

a. 1st Platoon

Comprised of enlisted Navy corpsmen and dental technician personnel, this Platoon maintains and manages medical and dental materiel for the AMMAL blocks that are issued to requesting units. In this study, only AMMALs are discussed. Presently, there are 24 types of AMMALs for use by I MEF units during MAGTF operations (Appendix A.) These AMMALs are issued to the units as self-contained blocks designed to support specific medical scenarios. Each block is assigned a Block Manager who is charged with ensuring maximum attainment levels are obtained by inventorying, removing shelf-life material, and issuing AMMALs to requesting units.

b. 2nd Platoon

This Platoon's main personnel composition is mostly Marine Corps supply technicians and a few Navy corpsmen. It is divided into the Procurement, Warehouse and Data Sections. The Platoon's main function is to procure materiel for all assigned AMMALs. Once received, the materiel is either stored or issued to respective Block Managers for AMMAL block inclusion. The Warehouse Section stores bulk materiel for re-supply in two 15-day units.

3. Information Technology (IT) Infrastructure

When initially undertaking this study, the researchers interviewed each Med Log Co to ascertain which would be best to process map. During these interviews, it was discovered that each Med Log Co operated different IT logistical systems. These systems are the Defense Medical Logistics Support System (DMLSS), Theater Army Medical Management Information System, a medical logistics interface for the Supported

Activities Supply System (SASSY), and Asset Tracking for Logistics and Supply System (ATLASS.) Numerous efforts have been undertaken to standardize this important aspect for all of the Med Log Cos without much success to date.

The fact that all three companies have separate systems leads one to believe that the medical procurement process is a highly charged political decision. Ultimately, the end-users (the personnel assigned to the units and the warfighter) have to suffer with programs that will not cross talk or may not be able to provide the needed information during a crisis or conflict. Initiating IT program changes without a champion and buy-in from key personnel can be detrimental for those who have to use those programs on a daily basis.

Currently, the 1st Med Log Co has two IT systems in place: one medical system and one Marine Corps supply system. It is not apparent if there is a champion, dedicated resources or proper personnel training to maintain at least one of these programs. Before the recent installation of a 'homegrown' bridge program, the two systems did not communicate with each other. Now, the systems are able to communicate through a shared drive and translation program using Lotus® Interface. Once the corporate knowledge within 2nd Platoon transfers, there may be a loss of functionality and ability to maintain these two separate systems.

a. DMLSS

A Congressionally mandated information technology innovation; DMLSS was initially implemented mainly at fixed medical facilities in 1996 as a result of lessons learned from DS/DS. This system was placed into operation at 1st Med Log Co in 1998 as a test initiative, in an effort to improve methodologies required to maintain AMMALs

at an acceptable attainment level. The full system is not being used within the 1st Med Log Co and is only located within 1st Platoon's purview. There are no plans to update or provide funding to maintain this system. It should also be noted that even though the system was placed at 1st Med Log Co to test its effectiveness for possible use by all three Med Log Cos, there seems to have been no corporate buy-in from the Marine Corps or BUMED to fully fund or support this initiative.

Within this context, the assemblage portion is primarily used to inventory and manage assigned blocks. Block Managers have the capability to input manually derived information and print reports that help with functions such as shelf-life management and assessment of attainment levels. They are also able to create replenishment orders and transmit them to 2nd Platoon via a shared drive. Once received by 2nd Platoon, these orders are then translated via the bridge program and received into ATLASS for further action.

b. ATLASS

ATLASS integrates the functionality from the Landing Force Asset Distribution System and Personal Computer SASSY that were subsequently eliminated with the implementation of ATLASS. ATLASS is designed for use by the MAGTF in garrison or a deployed environment to support movement, planning, execution, and subsequent employment of materiel by assigned forces. It provides a synergistic method to requisition, control, and manage assets providing MAGTF commanders with visibility of assets versus allowances. [Ref. 14]

C. BASELINE ORDERING PROCESS

Once a deploying unit (customer) has identified that it has a pending mission and will need medical assets, five separate activities are undertaken to complete the process. These steps are: 1) Requirements Generation, 2) Validation of Requirements, 3) AMMAL Pre-Issue Activity, 4) AMMAL Issue Activity and 5) AMMAL Post-Issue Activity. At present, the entire process is mostly a manual, paper driven process with fragmented use of IT. For this study, these steps represent the focal point needed to describe the existing method and are being used as a model for possible redesign. These activities provide fertile ground to potentially leverage existing technology through innovation.

1. Requirements Generation

After an initial need is identified, I MEF deploying units state their needs by submitting written requests to the HSSO. Each unit is charged with making its needs known once a mission is assigned. Due to the present configuration of the AMMALs, deploying units must take all or none and have limited ability to break the units into smaller pieces. Initiatives are in place to align the AMMALs with current doctrinal initiatives, but an examination of these initiatives is beyond the scope of this project.

2. Validation of Requirement

As stated above, the customer's needs are validated by the HSSO for the pending mission. This validation comes from the HSSO who completes this validation by verifying through historical records what medical assets (personnel and materiel) should be issued to the customer. The customer then requests these assets through the appropriate channels. Medical materiel is requested in writing to the Med Log Co.

3. AMMAL Pre-Issue Activity

After receiving a request from a customer, the Administrative Section coordinates a pre-limited technical inspection (LTI) with the requesting customer and 1st Platoon. During the pre-LTI, both parties manually inventory each AMMAL block being issued to ascertain if there are any discrepancies. Subsequent discrepancies are rectified before issue if the block is not at the required attainment level. An assemblage packing list is generated, printed from DMLSS and is used as the inventory list for the pre-LTI.

4. AMMAL Issue Activity

Once all discrepancies are rectified, the AMMAL is issued to the requesting unit for use to complete the assigned mission. Support for replenishment during the mission is requested through normal channels, with the caveat that if needed, support is maintained at the 1st Med Log Co.

5. AMMAL Post-Issue Activity

After completion of the assigned mission, each unit returns the AMMAL to the 1st Med Log Co for inventory, replenishment, and storage. Once received, a post-LTI is completed with the customer and 1st Platoon. From this post-LTI, a replenishment list is generated and units are charged accordingly. The replenishment list generates a procurement order through DMLSS. This order is then transmitted through a shared drive to 2nd Platoon to issue stock from the Bulk Warehouse or identification of a SOS for eventual re-order and receipt of needed material to restock the AMMAL.

D. PROCESS INNOVATION

DS/DS caused DoD medical departments to examine their logistical processes, rethink their modalities and radically redesign how business is transacted. As a result, dramatic improvements have been noted in cost, quality, and speed of logistical delivery.

Doctrinal changes, specifically *Focused Logistics*, have caused medical logisticians to continually examine their processes and seek improvements through any means necessary. Due to the continued technological explosion opportunities to innovate, enhance organizational performance, and improve the logistical process, continue to abound. For this reason, the 1st Med Log Co's current process provides a fertile ground for further innovation. [Ref. 15]

Process innovation is an outgrowth of re-engineering initiatives being undertaken in the business world and remains in concert with current initiatives to employ better business practices in DoD logistics. Within this framework, researchers have sought to define and model the "as is" (i.e., baseline) process, obtain process measurements, and provide possible alternatives for redesign.

Organizations should seek to perform process innovations on activities, which may offer greater potential to leverage existing technology. In logistics, innovations are said to lend themselves well to transactions involving indirect (non-productive) goods and services. [Ref. 16]

1. Improvement vs Innovation

Improvement is defined as "the act or process of improving; the state of being improved; *esp*: enhanced value or excellence." [Ref. 17] Process improvement is a continuous activity, an outgrowth of total quality management principles. It is a methodology that begins at the lowest organizational level possible and seeks to add value or increase efficiency incrementally within smaller business units as opposed to improving an entire organization. [Ref. 4]

Innovation is defined as the introduction of something new, whether it is an idea, method or device, into an existing system. Davenport further defines process innovation as:

> ...stepping back from a process to inquire into its overall business objective and then effecting creative and radical change to realize order-of-magnitude improvements in the way that objective is actually accomplished. [Ref. 4]

It is a way to examine the entire process and encompasses how that process fits with the strategic objectives that have been established. If properly implemented through modeling, simulation, and with a developed plan, process innovation has been shown to not only improve overall efficiency but to be a methodology that may significantly reduce operational costs.

By way of summarizing this discussion, Davenport compares process improvement and process innovation as listed in Table 2.1.

	Process Improvement	**Process Innovation**
Level of Change	Incremental	Radical
Starting Point	Existing process	Clean slate
Frequency of Change	One time/continuous	One time
Time Required	Short	Long
Participation	Bottom-up	Top-down
Typical Scope	Narrow; within Functions	Broad; cross functional
Risk	Moderate	High
Primary Enabler	Statistical control	IT/cultural
Type of Change	Cultural	Structural/cultural

Table 2.1. Process Improvement vs Process Innovation. [Ref. 4]

2. Davenport's Methodology

Five major phases are stated to be a part of Davenport's overall framework for process innovation. They are: 1) Identifying Process for Innovation, 2) Identifying

Change Levers, 3) Developing Process Visions, 4) Understanding Existing Process and 5) Designing and Prototyping the New Process. [Ref. 18] Each is addressed in turn.

a. Identifying Process for Innovation

To complete this initial phase, the organization must first identify and define processes that have a direct impact on the entire organization. All processes should be known and listed by the organization. An initial survey can be performed to ascertain existing boundaries and establish the scope for individual initiatives for innovation. Five key activities must be undertaken during this phase.

(1) Enumerate Major Processes. Process identification is key to making definitions and showing what their impact can be on the organization. Literature reveals that the number of processes can range from one to many. [Ref. 4] An organization must decide what trade-offs in a particular organization are needed to appropriately manage interdependencies and ensure that the overall scope of the innovation is manageable.

(2) Determine Process Boundaries. After initially identifying the processes on a principal (higher) level, an organization must then define all boundaries that surround the process. Ownership for each process should then be identified, and owners should distinguish where the process begins and ends, along with inter-relationships between processes and sub-processes.

(3) Assess Strategic Relevance of Each Process. To perform any innovation, the innovation's scope must be based upon an organization's inherent capabilities and resources. History tells that frame breaking radical change may not be well received within the military setting as such; process innovation requires high-level

coordination to improve the chances for success. When multiple innovation initiatives are undertaken, an organization should ensure that there is a complete understanding of the level of change and realize that the possibility for upheaval throughout the ranks may occur.

(4) Render High-level Judgments of the "Health" of Each Process. This phase requires that an organization prioritize processes that are felt to be problematic and in most need of improvement. Those with higher levels of priority should receive the highest priorities and become the first to be innovated.

(5) Qualify the Culture and Politics of Each Process. Historically, frame breaking radical change in a military setting has not been commonplace. As such, if that change does not have a designated champion, as is needed with process innovation, the redesigned process innovations are unlikely to succeed. Davenport strongly recommends that a champion be assigned and that the organization must establish and embrace a firm commitment to follow through with the innovation.

b. Identifying Change Levers

To assist the organization in identifying change levers that will drive the process innovation, the following procedures should be examined.

(1) Identify Potential Technological and Human Opportunities for Process Change. The initial step to use when identifying change levers is that an organization must analyze both technological and human factors that can affect the process. Organizations must be cognizant that they are not focusing on achieving change by using IT alone. Although very powerful, IT is only one of many enablers of change that may be used to complete a total process innovation.

(2) Identify Potentially Constraining Technological and Human Factors. Any constraints to process innovation should be identified during this phase. Once identified, a trade-off can be established by the organization to decide which constraints should be accepted as a part of the innovation and which ones will affect the innovation and should be defeated during the innovation.

(3) Research Opportunities in Terms of Application to Specific Processes. This step involves analyzing potential opportunities, that if put into place, would assist with the achievement of organizational goals and cause the process to be innovated. Analysis is key to this phase. All enablers should be identified and examined from all sides to ascertain if true improvements can be seen.

(4) Determine Which Constraints Will Be Accepted. In this last phase, all constraints identified from above should be examined by the champions to determine if the organization should overcome them or if they should be left as they are for future consideration and innovation.

*c. **Developing Process Vision***

To move to the next phase, the organization must embrace past results and develop a process vision to ensure success with the entire process innovation. Also of note in this phase is that a true champion and vision must be identified.

(1) Assess Existing Business Strategy for Process Directions. Successful completion of a process innovation requires that the organization must have a well-defined strategy. This strategy should be measurable, specific in function, provide inspiration, and have long-term value.

(2) Consult with Process Customers for Performance Objectives. Organizational change that is accompanied by the end-user (internal or external) in mind is imperative if that change is to remain a part of the organization's culture. A thorough understanding of the customer's requirements and concerns is integral to ensuring success. By continuously consulting with the end-user, the future implementation can be bettered, understood, and embraced.

(3) Benchmark for Process Performance Targets and Examples of Innovation. Benchmarking is another integral part of process innovation. Benchmarking allows an organization to compare its processes against similar organizations in a quantitative fashion. Further qualitative analysis is needed to understand the differences among processes and factors that may cause those differences to occur. Organizations may be able to improve their strategic position and gain competitive advantage by performing comprehensive benchmarking. [Ref. 19]

(4) Formulate Process Performance Objectives. This phase requires an organization to establish process objectives based on the process vision that is developed. Process goals, desired improvements, quantitative benchmarks, and time spans are the objectives that need consideration.

(5) Develop Specific Process Attributes. A primary focus during this phase is to establish qualitative, descriptive factors for both the vision and process objectives. Three key areas should be the subjects for this focus: technology, process outputs, and people.

d. Understanding and Improving Existing Process

Integral to this phase of process innovation is the documentation of the current process flow. Properly and accurately depicting the process flow is necessary because of the need to understand existing processes, which facilitates communication among all participants in the organization's innovation initiative. Innovators who do not comprehend the underlying process may not be able to efficiently move forward with the redesigned process or recognize anomalies that may be present (or may occur.) Lastly, by understanding the current process, an organization may envision values associated with proposed process innovations. Four steps are involved with this phase.

(1) Describe the Current Process Flow. By understanding the current process flow, an organization is able to focus efforts and perform a thorough analysis in a timely fashion. Graphically depicting the process, with a tool such as an attributed digraph (A-digraph), allows all concerned to better understand the baseline "as is" for the concerned process. This description is integral for further analysis.

(2) Measure the Process in Terms of New Process Objectives. Next, an organization should provide quantitative measurements based on performance objectives to highlight trouble areas in the current process.

(3) Assess Process in Terms of New Process Attributes. Once a quantitative assessment has been completed, the organization must make an initial assessment of these trouble spots in terms of the process vision. This assessment guides the organization as it seeks to complete its innovation.

(4) Identify Problem Areas. This is done to examine the process for possible shortcomings, short-term improvements that can be realized, to

assess current IT infrastructure and organization as a whole. Once identified, short-term fixes (improvements) are undertaken to assist with the completion of the overall process innovation.

e. Designing and Prototyping the New Process

To complete the innovation steps, organizations must begin implementation with a constant look back and toward retooling. This involves six steps.

(1) Brainstorm Design Alternatives. An objective of this first step is to brainstorm new process designs. By gaining a comprehensive understanding of the process vision, organizational members may be able to establish new, creative methods to perform and leverage existing technologies for re-design.

(2) Examine Feasibility, Risk, and Benefit. Before implementing a full-fledged process innovation that may be costly, an organization should seek to identify any inherent bottlenecks or problem areas that may be associated with the redesign. Constant feedback on each redesign alternative is presented for further evaluation.

(3) Selection of Preferred Process Design. Technical experts and champions (senior management) should all be present at the table to facilitate this decision step. Without the proper levels of buy-in, the process innovation may not succeed.

(4) Prototype New Process Design. During this phase, key resources should be matched against the new process to ascertain fit with the organization's strategy. This should be done on a small scale to decrease the impacts of unforeseen problems and costs. It is noted that this may not occur with one iteration;

indeed, it may take several cycles. This is also the time when the new process is refined to provide the end-user with a better product.

(5) Develop Migration Strategy. A phased migration strategy may be chosen vice an all or nothing approach. The greater the overall risk of the process innovation, the more cautiously an organization should tread. A balance between technological improvements and cultural changes should be examined for fit before full implementation.

(6) Implement New Organizational Structure and System. The final phase of performing a process innovation is to execute the migration strategy. This also marks the completion of the process innovation according to Davenport. [Ref. 4]

3. KOPeR

Clearly, documenting and understanding a process before performing measurements is essential. Davenport lays the foundation for completing this endeavor with his process innovation methodology. To effectively accomplish a process innovation, one can employ a tool such as Nissen's KOPeR [Ref. 20] as a redesign method and analysis tool. Developed as a result of work in the field of Artificial Intelligence (AI), KOPeR is designed to lead the innovator through a process design to implementation using quantitative measurements, which highlight inherent pathologies and assist with the diagnosis.

Figure 2.3 is a graphic representation of how process innovation is supported by the KOPeR model. By using KOPeR, the innovator may be able to anticipate which redesign alternatives will yield the most dramatic performance improvements. A continuous tool, KOPeR allows for repeated analysis of redesign alternatives and helps to

identify the best possible outcome (or combination thereof) for implementation. Once a baseline process model is developed and measurements are obtained, KOPeR automates the steps required to diagnose pathologies and predict which redesign transformations will best improve process performance. The manager then uses these transformations to generate new process designs, which are then tested (e.g., though measurement) to support the decision regarding selection of the most promising redesign alternative.

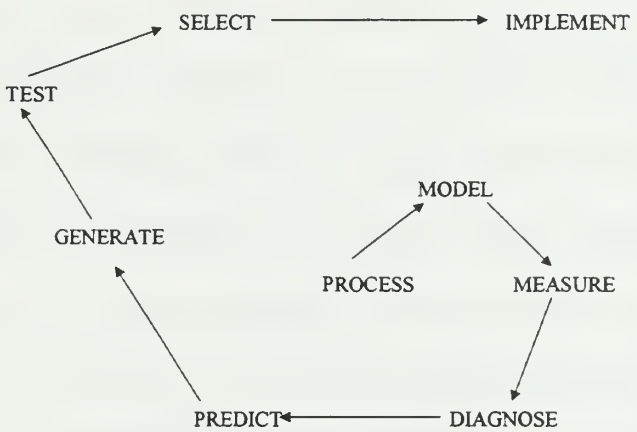

Figure 2.3. KOPeR Redesign Methodology. [Ref. 20]

E. SUMMARY

Since DS/DS, many innovations have improved the delivery of health services for our nation's fighting forces. The logistical pipeline for all materiel is being shortened in fixed facilities as well as for shipboard operational units to help bring about cost savings to a cumbersome system. MAGTF medical logistics represent a fertile area that may yield numerous process innovations in the future. One example of a possible innovation

is to employ automated identification technology (AIT) in the form of bar coding or radio frequency tags to inventory and replenish AMMALs. Another example of such an innovation is a shift to a web-based procurement process that may yield positive results and provide necessary feedback to all system players.

Davenport's process innovation methodology, coupled with KOPeR, can assist logistical leaders in the development of innovations. Subsequent chapters address this issue.

III. PROCESS

A. METHODOLOGY

In this chapter, the current process of procuring medical supplies at the 1st Med Log Co is analyzed using a process innovation framework and KOPeR. Information and data are collected through literature reviews, interviews and site visits to the 1st Med Log Co, a Naval Hospital, a local community hospital, and an e-commerce company.

The research for this thesis includes two site visits to the 1st Med Log Co, Supply Battalion, 1st FSSG, Camp Pendleton, California. Additionally, site visits to the Naval Hospital Camp Pendleton, California, the Community Hospital of the Monterey Peninsula, Monterey, California, and to the corporate headquarters of Medibuy.com were conducted. These visits provided the researchers with an opportunity to gather and observe first hand how each organization procures medical supplies from a user's standpoint. The process flow of how medical supplies are procured at the 1st Med Log Co, as observed and documented by these researchers, is used as the baseline "as is" for further analysis in this thesis.

The baseline process is analyzed using a KOPeR focus. Developing a detailed process flow model of the current 1st Med Log Co procurement process is the first step in the KOPeR methodology. This process is presented in Chapter II. Building upon this, a detailed outline is presented to explain in detail the tasks that are completed in each step of the process. The process flow model also presents the detailed sequence of each task in order to achieve the end result.

The next step in utilizing the KOPeR methodology is to obtain measurements of the "as-is" baseline procurement process and quantify them through KOPeR. The

KOPeR methodology dissects the presented process into specific pathologies that can be useful as an aid to adjust the process. Utilizing KOPeR in evaluating potential redesign alternatives significantly reduces the risks of implementing an alternative whose value may appear quite promising on the surface but, in execution, offers only minor improvements or value added. [Ref. 20]

A sample of KOPeR diagnostic measures and their corresponding pathologies is listed in Table 3.1. Measures are computed from the process model in each case. As an example, the first measure, parallelism, is computed directly from the process model (e.g., process size divided by length) and quantifies the degree to which a process flow is laid-out sequentially. The corresponding pathology is that a sequential process tends to take longer (e.g., higher cycle time) to complete than its concurrent counterparts. [Refs. 18 and 20]

By building on these measurements and pathologies, KOPeR focuses on providing recommendations that can improve and streamline business activities such as those associated with the 1st Med Log Co's procurement process. [Ref. 18]

KOPeR Measures	KOPeR Pathologies
Parallelism	Identifies the degree to which a process flow is sequential.
Hand off Fraction	Identifies the level of friction produced in a process caused by the hand off of work from one person to the next.
Feedback Fraction	Identifies the level of rework produced when a checking approach to quality is used.
IT Support Fraction	Identifies the level of IT available to support a process such as decision support systems that can enhance knowledge.
IT Communication Fraction	Identifies the level of IT communications to support a process such as e-mail, shared databases, and shared networks.
IT Automation Fraction	Identifies the level of IT available to automate the process such as intelligent agents and expert systems.

Table 3.1. Definitions of KOPeR Measures and Pathologies. [Ref. 21].

Recommendations for a KOPeR redesign process are matched with diagnosed pathologies using reengineering knowledge stored in the form of rules. Further detailed reading pertaining to KOPeR can be found in the KOPeR Redesign Agent Home Page and "Reengineering the RFP Process Through Knowledge-Based Systems." [Refs. 20 and 21]

B. PROCESS ANALYSIS

Modeling and measuring the current 1st Med Log Co procurement process for analysis by KOPeR is the next step in the methodology. This is accomplished by utilizing figures to graphically explain in outline form the current "as-is" procurement process.

1. The 1st Med Log Co Procurement Process

Figure 3.1 depicts the current, "as-is" five-stage procurement process being used at the 1st Med Log Co. Each stage contains specific tasks that must be accomplished in sequence. These stages are:

- Requirements Generation
- Validation of Requirement
- AMMAL Pre-Issue Activity
- AMMAL Issue Activity
- AMMAL Post-Issue Activity

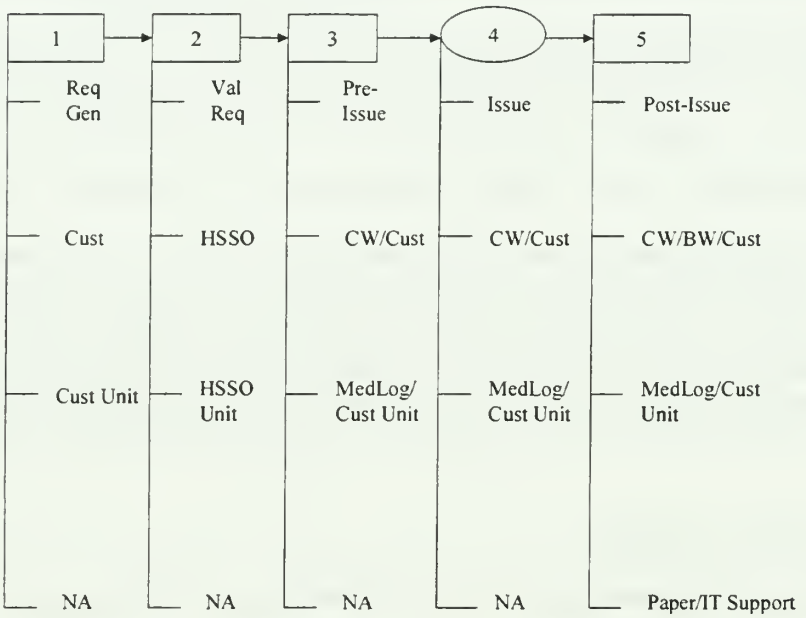

Figure 3.1. Current 1st Med Log Co Procurement Process.

Figure 3.1 delineates a top-level process flow for the current medical procurement process as it stands today at the 1st Med Log Co. Either a rectangular or a circular node identifies each of the major activities listed in the process. The rectangular nodes

indicate activities comprised of lower-level sub-process tasks. The circular node indicates an atomic activity with no lower-level sub-process tasks.

Aligned under each node is a listing of attributes that identify the following process elements: 1) activity name, 2) role of the agent responsible for its performance, 3) organizational affiliation of the agent, and 4) technology employed for process support and communications. This A-digraph provides the baseline process information required for KOPeR analysis. [Ref. 20]

The first stage of the 1st Med Log Co procurement process (i.e., the requirements generation activity) begins when the customer (e.g., those activities and deploying units which are supported by the 1st Med Log Co) generates a requirement. The flow of work in this stage is depicted in Figure 3.2.

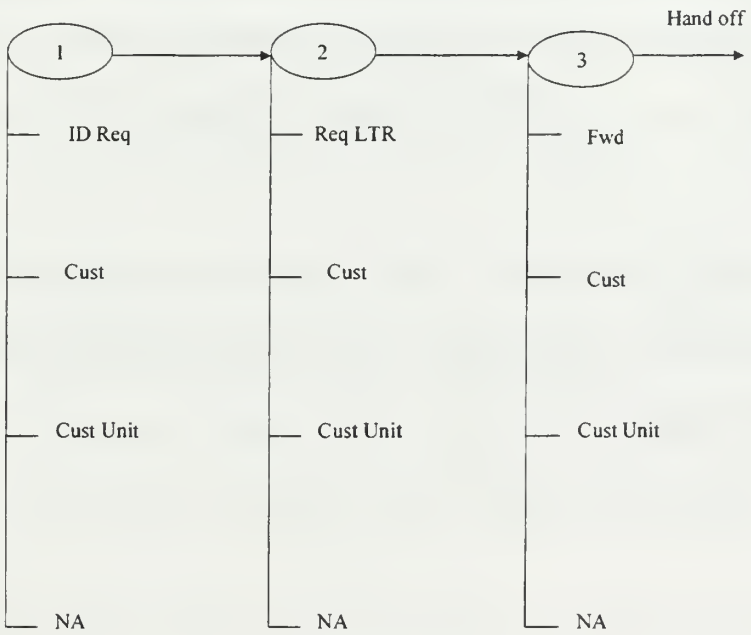

Figure 3.2. Requirements Generation.

This stage begins with the customer who:

- Identifies the requirement
- Generates a request for analysis letter
- Forwards the request for analysis letter to the HSSO

As an example, one can readily identify the four attributes associated with the lower-level sub-process: 1) activity name ("Identification of Requirement"), 2) agent role ("Customer"), 3) organization ("Customer Unit"), and 4) Technology ("NA for not applicable"). All other sub-processes are labeled in a similar fashion.

Presently, this stage of the process is completed without the support of IT (e.g., "NA" for technology) to aid the customer from the parent activity or deploying unit in identifying what the requirement would be to support their particular mission. Currently, this is a paper-based process where the customer prepares a letter in a standard format and manually sends the request to the HSSO. Once the hand off is completed, the customer must wait for the HSSO to evaluate and validate the request. This action is usually started four to six weeks before the customer will take physical possession of the AMMAL.

The next stage in the current 1st Med Log Co procurement process (i.e., the validation of requirements activity) begins as the customer hands off the request to the HSSO as depicted in Figure 3.3.

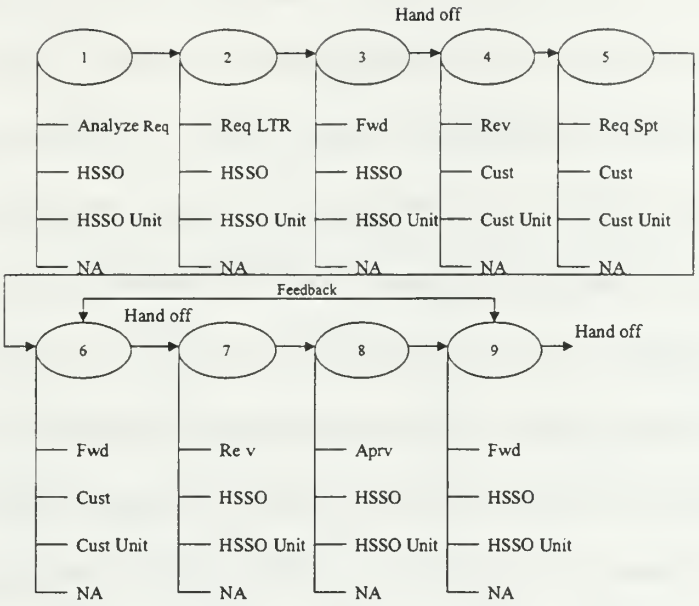

Figure 3.3. Validation of Requirement.

The Validation of Requirement stage begins with:

- Analysis of the request by the HSSO
- Generation of mission needs by the HSSO
- Forwarding of mission needs letter to customer
- Review of validated requirements by customer
- Generation of request for AMMAL support by customer
- Forwarding of request for AMMAL support to HSSO
- Review of request for support letter by HSSO
- Generation of approval letter for AMMAL support by HSSO
- Forwarding of approval letter for AMMAL support to the 1st Med Log Co and feedback provided to customer concerning their request for support

In this second stage, the HSSO analyzes and validates the mission that the customer is requesting support for. Types of missions range from six-month unit deployment rotations aboard Naval vessels, Combined Arms Exercises, and planned unit

field training to maintain combat readiness skills. Once the mission is validated, the HSSO determines which AMMALs will be required based on certain criteria such as length of deployment/exercise, geographical location, level of medical treatment available within the pending mission region, number of personnel participating, and type of training to be performed. Based on this estimate, the HSSO determines if the customer has sufficient funds available to cover the estimated cost of using the contents in the AMMAL(s.) The HSSO then forwards the estimate back to the customer, who then reviews the HSSO's estimate and formalizes a specific AMMAL support request back to the HSSO for formal approval. At this time, the HSSO reviews and approves the customer's AMMAL support request and generates an approval letter to be forwarded to the 1st Med Log Co for action with a feedback copy to the customer.

Stage three of the process begins as the HSSO hands off the formalized approval of the support letter to the 1st Med Log Co as depicted in Figure 3.4.

The AMMAL Pre-Issue Activity includes the below steps:

- Pre-LTI scheduled
- Generation of pre-LTI confirmation letter
- Confirmation letter sent to customer and handed off to the Contingency Warehouse for action
- Block Manager determines AMMAL to stand pre-LTI
- Pre-LTI performed by Block Manager and customer

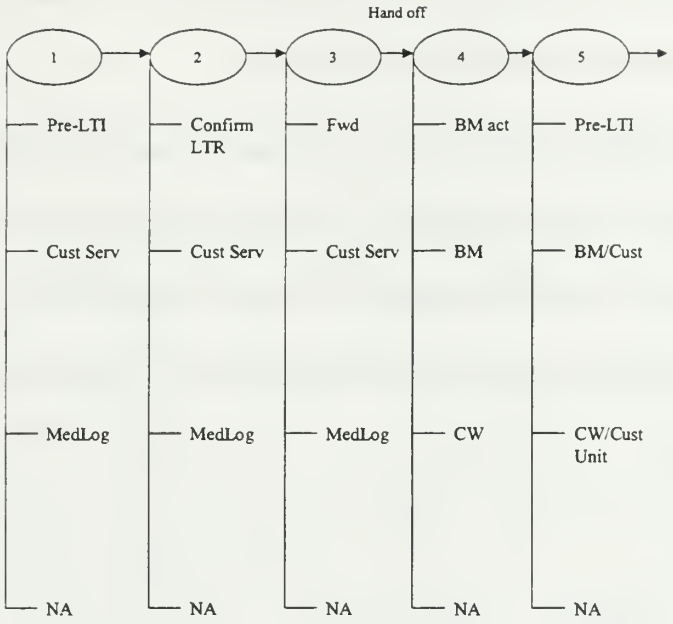

Figure 3.4. AMMAL Pre-Issue Activity.

Within the 1st Med Log Co, the Customer Service Section makes contact with the requesting unit/customer and schedules a pre-LTI for the AMMAL(s) to be checked out for use. Once a date has been agreed on, the Customer Service Section prepares a letter formalizing the scheduled pre-LTI with the customer. This letter is sent to the customer and handed off to the Block Manager of the Contingency Warehouse. Block Managers determine which of their assigned AMMALs will stand pre-LTI for issue to the customer.

On the specified date, the Block Manager and the customer inspect and verify every item in the AMMAL against a packing list. This original packing list is used again upon the customer's return of the AMMAL to verify used, missing, and damaged items. All used, missing, or damaged items are charged to the customer. Once the pre-LTI is completed, the Block Manager and customer sign the packing list, which is copied, and

then sealed in the appropriate AMMAL(s.) The AMMAL(s) are to remain sealed until the customer returns later to pick them up for deployment.

The fourth stage of the 1st Med Log Co procurement process is the AMMAL Issue Activity. The only task that occurs in this stage is when the customer returns to sign for the previously inventoried and sealed AMMAL(s), which are then issued for use. The time lapse between the pre-LTI and acquisition of the AMMAL is typically two to three weeks. Figure 3.5 refers.

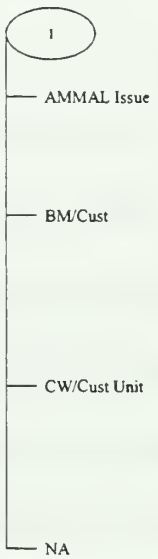

Figure 3.5. AMMAL Issue Activity.

The step required for AMMAL Issue Activity follows:

- Customer signs for and takes possession of AMMALs

The fifth and final stage of the 1st Med Log Co procurement process is the AMMAL Post-Issue Activity. Figure 3.6 refers.

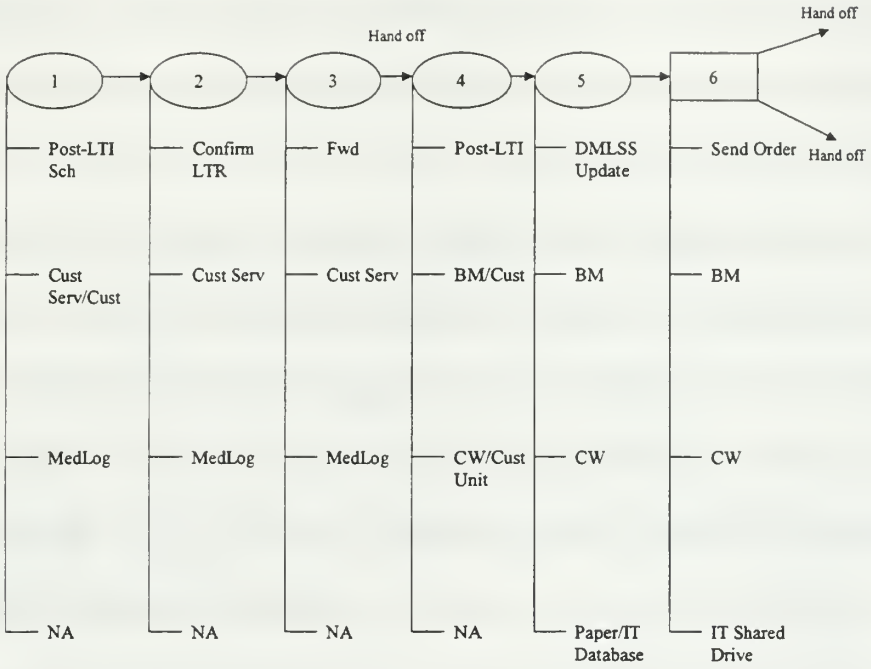

Figure 3.6. AMMAL Post-Issue Activity: Post-LTI Conducted.

The following tasks are required for the AMMAL Post-Issue Activity:

- AMMAL post-LTI scheduled between Customer Service Section and customer
- Customer Service Section generates a formalized inspection letter
- Letter sent to the customer and the Contingency Warehouse
- AMMAL post-LTI performed
- DMLSS updated using packing list as a source document
- DMLSS generated replenishment order placed on shared drive and hard copy printed for further action

The final stage of the medical procurement process begins when the customer returns from deployment and schedules a post-LTI with the Customer Service Section of the 1st Med Log Co. To formalize the inspection, the Customer Service Section generates a letter and forwards one to the customer and hands off another to the Contingency

Warehouse for action by the appropriate Block Manager. On the specified date, the customer and the Block Manager jointly perform the post-LTI on the AMMALs that had been previously issued to the customer.

During this inspection, the original packing list is used as the source document and any items that have been used, are missing or damaged beyond use are annotated on the packing list. The appropriate Block Manager uses the packing list to update the inventory list in the assemblage management portion of DMLSS. DMLSS generates a replenishment order based on the used, missing, or damaged items. The Block Manager prints a copy for file and places the AMMAL replenishment order on the shared drive for further action by the Procurement Section. This replenishment order on the shared drive awaiting further action and its printed copy are two separate hand off actions. See Figure 3.7.

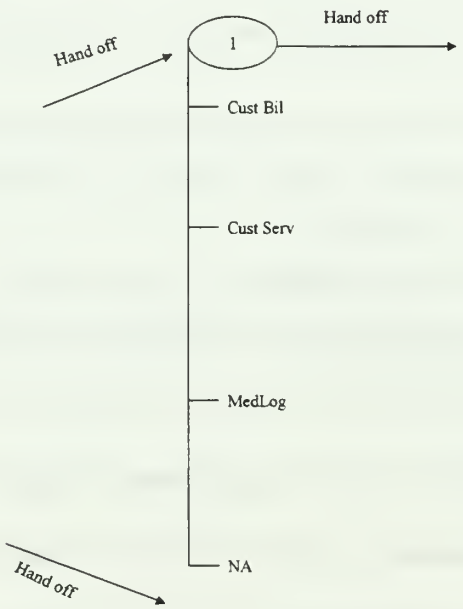

Figure 3.7. AMMAL Post Issue Activity: Customer Billing.

A first hand off occurs when a hard copy is given to Customer Service, which prepares a letter to be sent to the comptroller detailing the charges to be made against the job order number provided by the HSSO and a copy is sent to customer informing them of their charges. The second hand off is when the Procurement Section of the Bulk Warehouse downloads the replenishment order awaiting further action on the shared drive. At present, this download occurs twice a week, on Monday and Wednesday. The Technical Review Clerk in the Procurement Section downloads the order(s) and runs a translation program that converts the order(s) into ATLASS for further processing by the Procurement Section. See Figure 3.8.

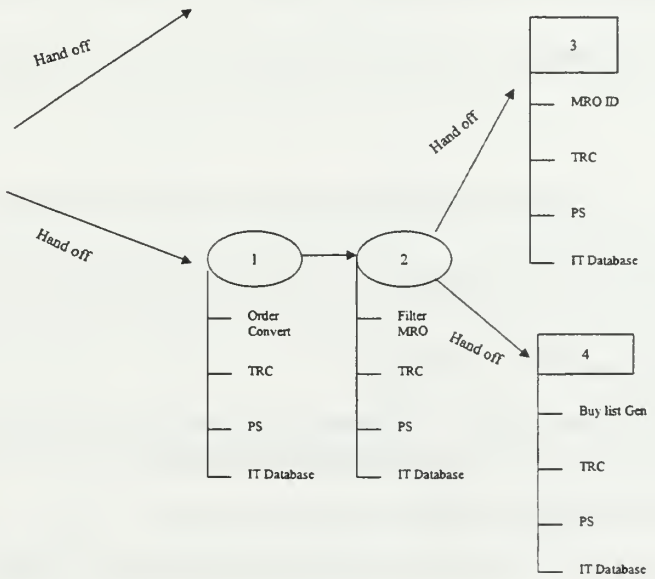

Figure 3.8. AMMAL Post-Issue Activity: Order Conversion.

After the conversion is complete, ATLASS must first filter each line item to build a material release order (MRO) for stocked material prior to processing that order. See Figure 3.9.

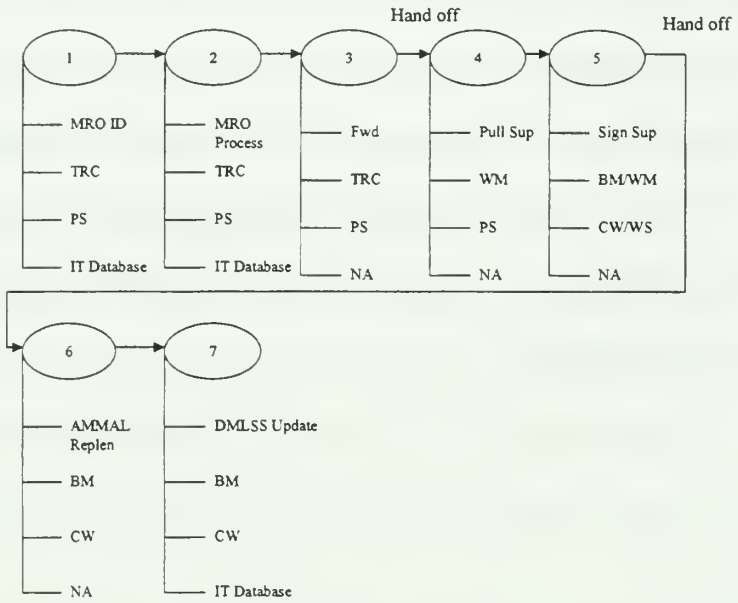

Figure 3.9. AMMAL Post-Issue Activity: MRO Identified.

If ATLASS detects that a MRO has been identified, the following steps occur:

- MRO item identified in ATLASS
- Technical Review Clerk processes the MRO(s) by printing them on DD1348-6 (Single-Line Item Requisition) forms
- MRO(s) are forwarded to the Warehouse Section
- Warehouse Section pulls items from bulk storage for issuance to Block Manager
- Block Manager sign for issued supplies
- Block Manager replenishes AMMAL
- Block Manager updates DMLSS

The Technical Review Clerk processes the MRO and prints a hard copy of the DD1348-6 (Single-Line Item Requisition) form. A hand off occurs here after the MRO(s) are printed. Twice a week, on Monday and Wednesday, the Warehouse Section retrieves the MROs that need to be processed. Each MRO lists one line item that is separated by bin location, and a respective location manager is tasked with pulling the supplies listed on the MRO(s) from their location in the warehouse. The appropriate Block Manager from the Contingency Warehouse signs for the pulled supplies on Monday and Wednesday. The Block Manager then restocks their AMMAL(s) and performs an update in DMLSS to reflect the resulting inventory for the AMMAL.

After ATLASS has filtered out the MROs and the Technical Review Clerk has processed them for hand off, a buy list is generated, printed, and distributed for further action by a designated clerk within the Procurement Section. See Figure 3.10.

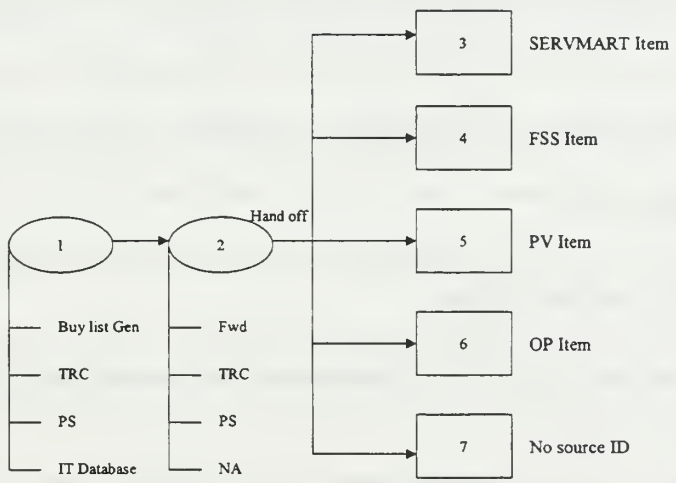

Figure 3.10. AMMAL Post-Issue Activity: Buy List Generated.

Steps involved in the buy list generation are:

- SERVMART item identified
- Federal Supply System (FSS) item identified
- PV item identified
- Open purchase item identified
- No source identified

As it is presently configured, ATLASS groups the buy list into one of five categories. These categories are by items that can be identified as a SERVMART, FSS, PV, or an open purchase item or one requiring further technical review because a source of supply (SOS) was not identified by ATLASS.

A designated SERVMART Clerk purchases items identified that can be procured at the local SERVMART on an as needed basis. After the items have been purchased, the clerk manually updates the buy list that was used as a source document and hands off the annotated buy list to the Technical Review Clerk. The Technical Review Clerk updates the ATLASS version of the buy list indicating which line items were procured to close out those line items. Once notified, the appropriate Block Manager signs for the supplies, replenishes the respective AMMAL, and updates DMLSS to reflect the changes in inventory. Figure 3.11 refers.

A SERVMART item action includes:

- Buy list identified SERVMART item handed off to designated clerk
- Verification of funds
- Clerk procures needed items from local SERVMART
- Buy list manually updated
- Buy list forwarded to Technical Review Clerk
- Buy list updated in ATLASS

- Supplies signed for by Block Manager
- AMMAL replenished
- DMLSS updated

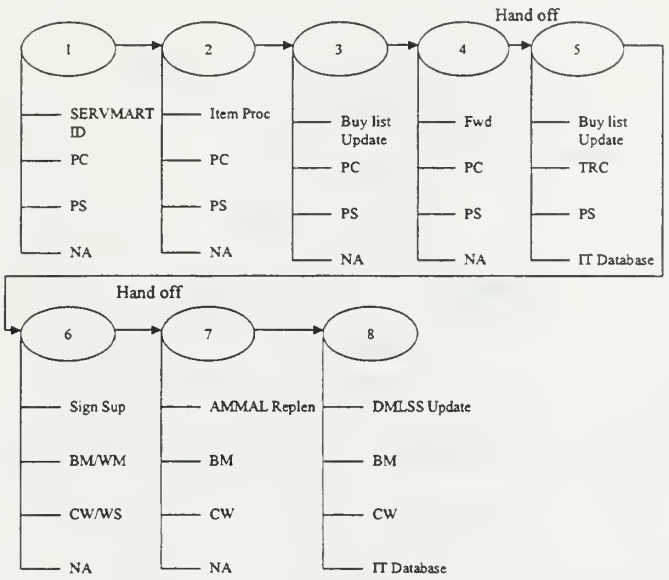

Figure 3.11. AMMAL Post-Issue Activity: SERVMART Item Identified.

Items that are available for procurement through the FSS are handed off to the designated clerk who performs direct turnover transactions. The clerk researches each item to ensure that they are readily available at the Defense Supply Center Philadelphia (DSCP), verifies fund availability, and places the item(s) on order. This research can usually be done using a computerized tool supplied by the DSCP or via a telephone call to DSCP's Emergency Supply Operation Center.

After the item is placed on order, the clerk manually updates the order buy list and hands off the list to the Technical Review Clerk, who updates the buy list in ATLASS to

reflect a due in status. Once the supplies are received from DSCP, the buy list is again updated to reflect the procurement of the supplies and to close out the order. The Block Manager signs for the materials, replenishes the designated AMMAL, and updates DMLSS to reflect the current inventory status. Figure 3.12 refers.

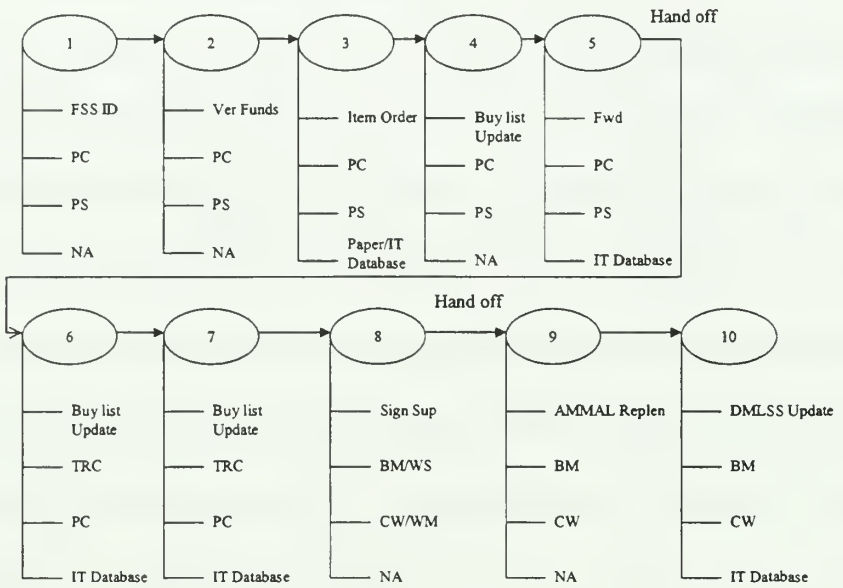

Figure 3.12. AMMAL Post-Issue Activity: FSS Item Identified.

FSS item actions include:

- Buy list item identified as FSS item handed off to designated clerk
- Verification of funds
- Item placed on order
- Buy list manually updated to reflect item on order
- Buy list forwarded to Technical Review Clerk
- Buy list updated in ATLASS to reflect due in status
- Buy list updated in ATLASS to reflect receipt of supplies
- Supplies signed for by Block Manager
- AMMAL replenished

- DMLSS updated

Items identified for PV purchase can be procured from three different types of PVs, depending on the type of supplies that need to be ordered. See Figure 3.13.

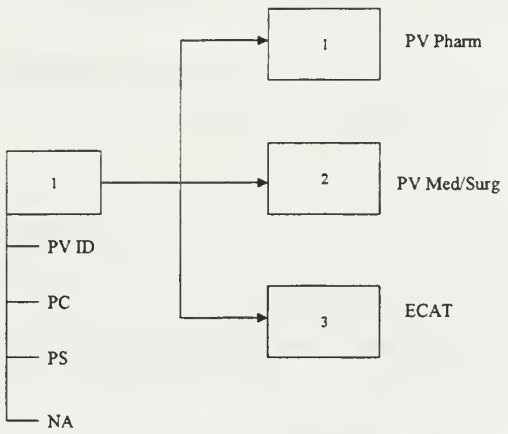

Figure 3.13. AMMAL Post-Issue Activity: PV Item Identified.

Pharmaceutical products are procured through a web site maintained by the designated PV. The assigned clerk first verifies availability of funds, then accesses the PV web site to research item availability, places the needed supplies on order, manually updates the buy list to reflect that the items are on order, and hands off the list to the Technical Review Clerk for updating of the buy list in ATLASS. Upon receipt of the supplies, the Technical Review Clerk updates ATLASS to close out the order. The Block Manager signs for the supplies, replenishes the AMMAL, and updates DMLSS to reflect the current inventory. Figure 3.14 refers.

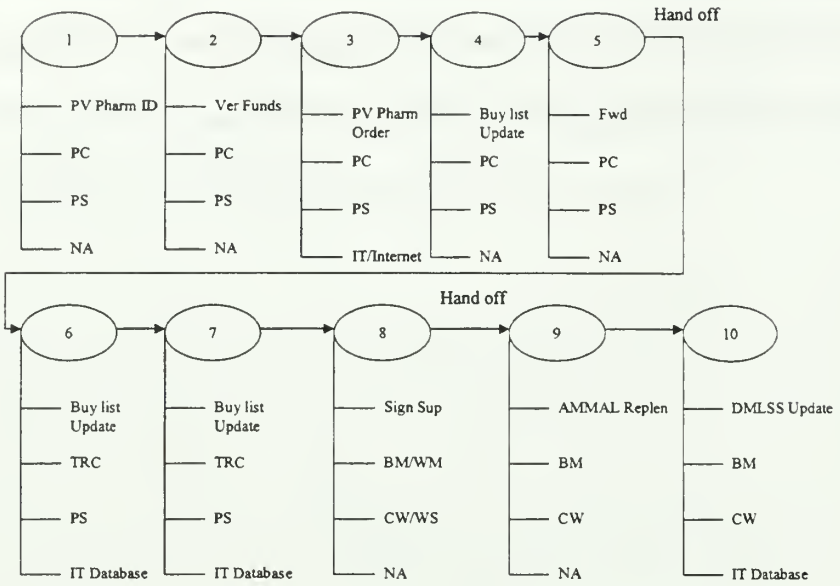

Figure 3.14. AMMAL Post-Issue Activity: PV Pharmaceutical Item Identified.

Steps in the PV Pharmaceutical process include:

- Item identified as pharmaceutical item
- Verification of funds
- Item ordered through PV web site
- Buy list manually updated
- Buy list handed off to the Technical Review Clerk
- Buy list updated in ATLASS to reflect due in status
- Buy list updated in ATLASS to reflect receipt of supplies
- Supplies signed for by Block Manager
- AMMAL replenished
- DMLSS updated

Medical and surgical products are ordered through a separate medical/surgical PV using an electronic data interchange (EDI) program supplied by the vendor. The clerk first verifies fund availability. Next, the clerk must access the EDI program to establish

item availability and then order the supplies as just-in-time or extended delivery items. The buy list is then manually updated by the designated clerk, who then hands off the updated list to the Technical Review Clerk, who in turn updates the ATLASS buy list. Upon receipt of the supplies, the buy list is updated in ATLASS to reflect receipt of the supplies and to close out the order. Following this, the Block Manager signs for the supplies received, replenishes the AMMAL, and updates DMLSS to reflect current inventory. See Figure 3.15.

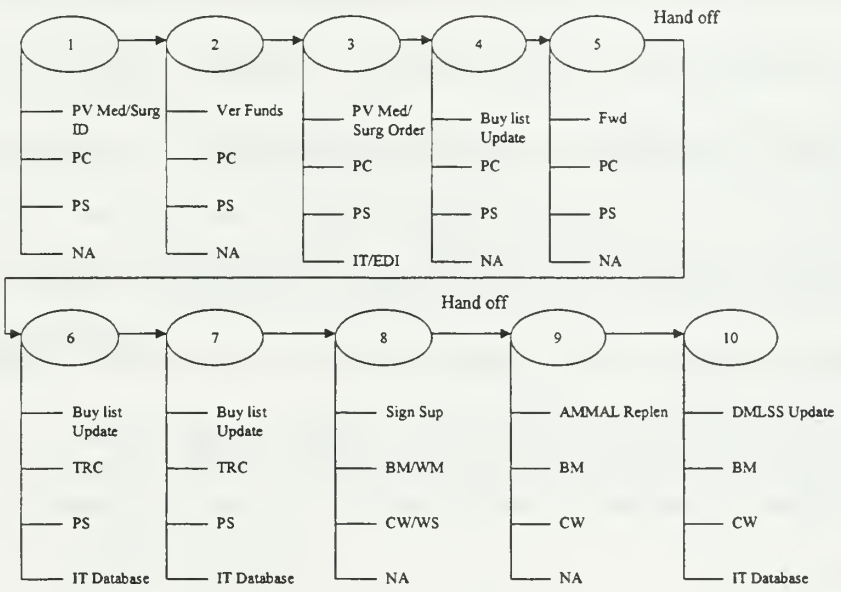

Figure 3.15. AMMAL Post-Issue Activity: PV Medical/Surgical Item Identified.

Below is a list of steps conducted to complete the process for PV Medical/Surgical material:

- Item identified as PV medical/surgical product
- Verification of funds
- Item ordered through PV EDI

- Buy list manually updated
- Buy list forwarded to the Technical Review Clerk
- Buy list updated in ATLASS to reflect due in status
- Buy list updated in ATLASS to reflect receipt of supplies
- Supplies signed for by Block Manager
- AMMAL replenished
- DMLSS update

Material identified that belongs to laboratory, dental, or optical categories is verified for SOS by using an electronic catalog (ECAT) furnished by DSCP (who acts as the PV.) Once funds have been verified, the assigned clerk accesses ECAT, verifies availability for each item, and orders the supplies. Afterwards, the buy list is manually updated to reflect that supplies have been placed on order. Next, it is handed off to the Technical Review Clerk who updates ATLASS to reflect a due in status. Once received, the buy list is again updated in ATLASS to reflect receipt and to close the order. The Block Manager then signs for the supplies, replenishes the indicated AMMAL, and makes the necessary DMLSS changes that will reflect current inventory. Figure 3.16 reflects the process for laboratory products only but remains the same for laboratory, dental, or optical.

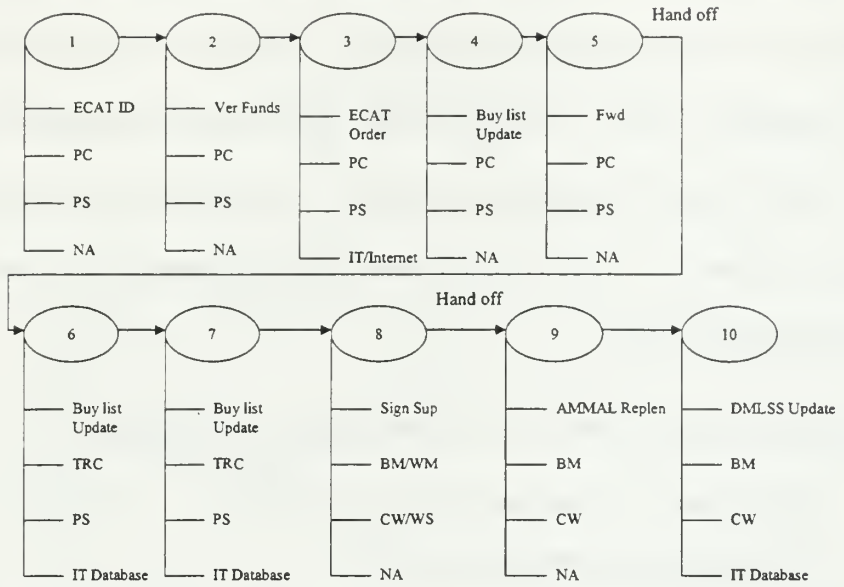

Figure 3.16. AMMAL Post-Issue Activity: ECAT Item Identified.

The steps to perform an ECAT transaction for laboratory, dental, or optical material are as follows:

- Item identified as being available through laboratory, dental, or optical e-catalog
- Verification of funds
- Item ordered through ECAT web site
- Clerk manually updates applicable buy list
- Buy list handed off to Technical Review Clerk
- Clerk updates buy list in ATLASS to reflect due in status
- Clerk updates buy list in ATLASS to reflect receipt of supplies
- Supplies signed for by Block Manager
- AMMAL replenished
- DMLSS updated

Items identified for open purchase are ones that cannot be procured via FSS, PV Pharmaceutical, PV Medical/Surgical, or ECAT. For these items, research must be conducted to identify a proper SOS and obtain related cost for procuring the needed material. This is done by using tools such as the Internet, paper catalogs, and telephonically. Figure 3.17 details the decision process necessary for items procured through open purchase methods.

Pricing differentiation for open purchase material is as follows:

- Total order cost less than $2,500
- Total order cost greater than $2,500

One designated Procurement Clerk is authorized to use a government purchase card for orders that total less than $2,500. The source document is prepared and funds verified by the Procurement Clerk and handed off to the Section Head for review and approval. Then, the document is handed back to the clerk, who submits the order to the identified source to procure the needed material.

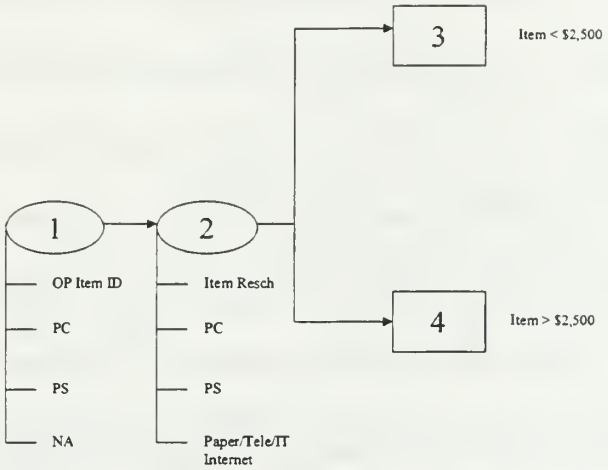

Figure 3.17. AMMAL Post-Issue Activity: Open Purchase Item Identified.

The Procurement Clerk manually updates the buy list and then hands it off to the Technical Review Clerk, who updates the ATLASS version of the buy list. Once the supplies have been received, the ATLASS version of the buy list is again updated and the order closed out. The Block Manager signs for the supplies, replenishes the AMMAL, and updates DMLSS to reflect the current inventory status. Figure 3.18 refers.

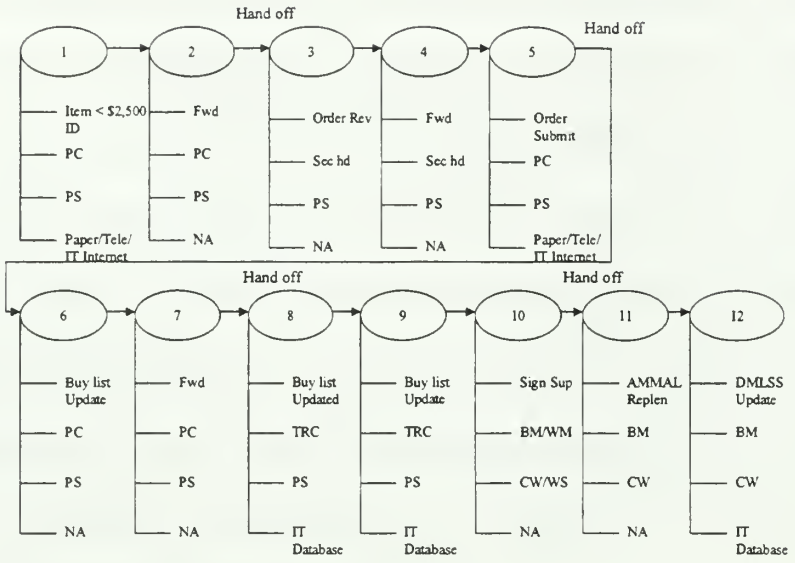

Figure 3.18. AMMAL Post-Issue Activity: Open Purchase Item <$2,500 Identified.

Open purchase orders for less than $2,500 are processed as follows:

- Source document prepared for orders identified as costing less than $2,500
- Verification of funds
- Request forwarded to Section Head
- Order reviewed by Section Head and approved
- Order returned to Procurement Clerk
- Procurement Clerk processes order
- Buy list manually updated
- Buy list forwarded to the Technical Review Clerk
- Buy list updated in ATLASS to reflect due in status
- Buy list updated in ATLASS to reflect receipt of supplies
- Block Manager signs for supplies
- AMMAL replenished
- DMLSS update

Open purchase orders greater than $2,500 are processed and then forwarded to the Bn Contracting and Purchasing Office for review and approval. The designated Procurement Clerk completes a source document for the item and hands it off to the Section Head for review. After the Section Head reviews the request, the source document is handed off to the Commanding Officer (CO) of the 1st Med Log Co for review and signature. The document is returned to the Procurement Clerk who transmits an electronic copy to the Contracting and Purchasing Office.

This office reviews the procurement document, approves the request, and enters the required information into a web-based system germane to the contracting and purchasing function. The Procurement Clerk periodically checks the web site to see if the order has been approved and processed. Once the order has been processed, the clerk manually updates the buy list and hands it off to the Technical Review Clerk who updates the ATLASS version of the buy list to reflect a due in status. When the supplies are received, the ATLASS buy list is again updated to reflect receipt of the order. The Block Manager signs for the supplies, replenishes the AMMAL, and updates DMLSS to reflect the current inventory of the AMMAL. Figure 3.19 refers.

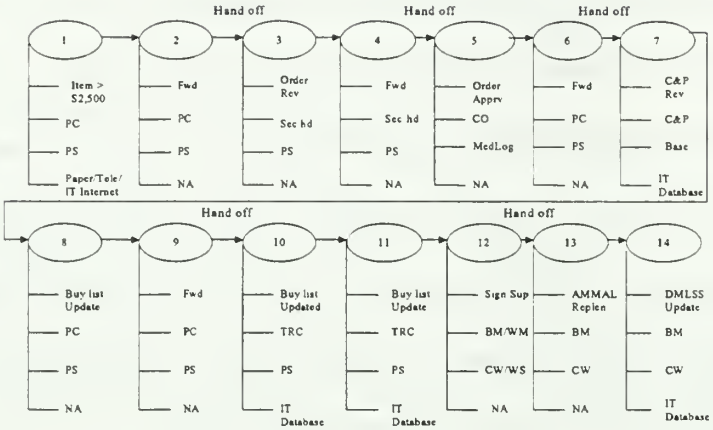

Figure 3.19. AMMAL Post-Issue Activity: Open Purchase Item >$2,500 Identified.

Orders identified with a total cost greater than $2,500 are processed as follows:

- Purchase document prepared for an order identified with a total cost greater than $2,500
- Verification of funds
- Request forwarded to Section Head
- Document reviewed by Section Head
- Document forwarded to CO for signature
- Purchase order signed off by CO
- Order forwarded to Contracting and Purchasing Office via a web-based system
- Contracting and Purchasing Office reviews, approves, and places the item on order
- Clerk updates buy list manually when item is placed on order by Contracting and Purchasing Office
- Buy list forwarded to Technical Review Clerk
- Buy list updated in ATLASS to reflect due in status
- Buy list updated in ATLASS to reflect receipt of supplies
- Block Manager signs for supplies
- AMMAL replenished
- DMLSS updated

When an item appears on the buy list that does not have a method of procurement or SOS annotated, further technical review is required. Figure 3.20 refers. Items requiring further technical review are processed as follows:

- Item identified on buy list with no method of procurement or SOS
- Clerk researches for potential method of procurement or SOS
- Buy list is updated in ATLASS to reflect method of procurement
- Updated buy listed handed off to the appropriate clerk for further action

The Technical Review Clerk initially researches the item in the Uniform Data Repository provided by DSCP, to identify a possible source such as FSS, PV, or open purchase. If a potential source is not determined through one of these venues, the Technical Review Clerk must review paper catalogs from various vendors, perform Internet based searches, or solicit information telephonically. Once a SOS has been determined, the Technical Review Clerk updates the buy list in ATLASS to reflect an appropriate SOS. An updated buy list is generated and handed off to the appropriate Procurement Clerk for further action as detailed above.

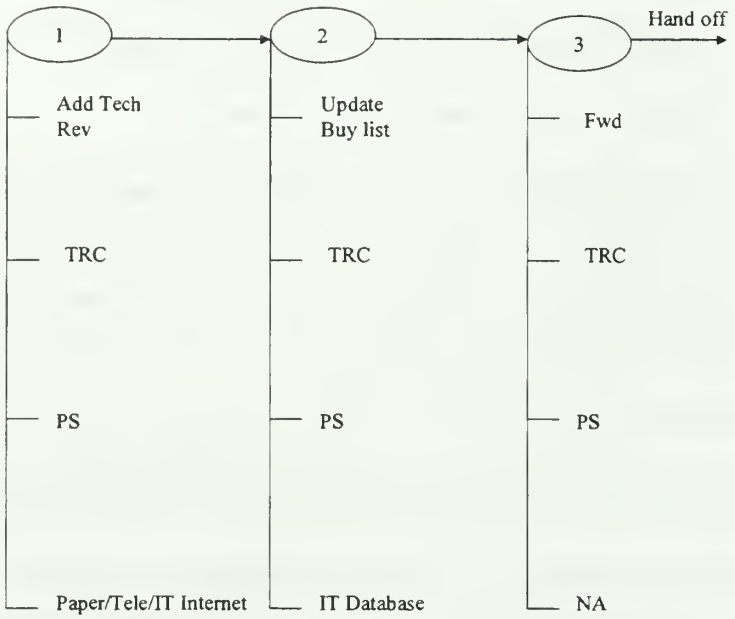

Figure 3.20. AMMAL Post-Issue Activity: No Source Identified.

2. Measurement of the Current 1st Med Log Co Procurement Process

The next step in the analysis of the 1st Med Log Co procurement process is to input the defined baseline "as is" process information into the KOPeR diagnostic model and evaluate the recommendations it provides in order to develop possible redesign alternative options. During this stage of the redesign methodology, KOPeR is taking the process model as developed and using measurements to detect severe pathologies and faults associated with the process. [Refs. 20 and 21]

The KOPeR redesign agent asks for the information listed in Table 3.2 in order to measure and diagnose the current process. Measurement definitions have been extracted from the KOPeR redesign model and are listed in Table 3.2. [Ref. 20] Process size is the total number of activities (task nodes) to complete the entire process. For the 1st Med Log Co, the procurement process size is 116. Process length is the longest path of

activity nodes needed to complete the process. At the 1st Med Log Co this process length is 45. Hand offs are the number of inter-agent transfers of work. KOPeR does this by counting the number of traverses of process work across different agent roles, departments, and organizations. The number of hand offs noted for this process is 37. Feedback loops reflect the number of quality/feedback loops in the process. In the current procurement process there is one feedback loop. The final measurements that are addressed by KOPeR deal with the amount of IT Support, IT Communication, and IT Automation in the current process. Currently, there are 39 instances of IT Support incorporated into the "as is" process.

Measurement	Value
Process Size	116
Process Length	45
Hand offs	37
Feedback Loops	1
IT Support	39
IT Communication	0
IT Automation	0

Table 3.2. KOPeR Measurements of Current 1st Med Log Co Procurement Process

Based on the measurements listed above, KOPeR's pathology diagnosis is as follows:

- Parallelism (2.578) – parallelism looks OK
- Hand off Fraction (0.319) – process friction
- Feedback Fraction (0.009) – feedback looks OK
- IT Support Fraction (0.336) – inadequate IT support
- IT Communication Fraction (0.0) – inadequate IT communications
- IT Automation Fraction (0.0) – IT automation first requires substantial infrastructure in terms of support and communication

The current medical procurement process is noted to contain parallelism. Identifying parallelism indicates that certain tasks have been streamlined, allowing tasks that are not mutually dependant upon one another to be performed at the same time, thereby shortening the overall process length. Process friction is present due to the number of hand offs that are made within the process. Hand offs occur when a task is passed to another person or organization in order for the process to continue. Lastly, the current procurement process is inadequate in its utilization of IT support, communication, and automation.

To redesign the 1st Med Log Co's procurement process, KOPeR makes the following recommendations:

- Use of a case manager (or dedicated team)
- Look into the use of IT for support, communications, and automation.

The recommendation to use a case manager or dedicated team (e.g., integrated process team) can dramatically reduce the amount of friction in the process. This solid source of knowledge can perform the process from start to finish, thereby eliminating the need for hand offs and inter-departmental coordination. Cycle time can be reduced, which can equate to both man-hour and total cost savings. [Ref. 20]

The recommendation to use IT is also offered as a plausible redesign alternative to consider. IT can be used to increase support to existing process communications (e.g. e-mail and shared databases through a local or wide area network), can provide for a smoother workflow, and substantially reduce process cycle time. The use of IT to increase support to process activities (e.g., decision support systems and intelligent systems) can be utilized to eliminate tasks and further streamline the process. Finally, the

use of IT to automate process activities is recommended, but first requires substantial infrastructure in terms of support and communication. Another possible use of automation is with an inventory management system that automatically reorders items when stock levels fall to a pre-determined point, thereby freeing personnel of routine tasks to concentrate on more strategically relevant objectives.

C. REDESIGN ALTERNATIVES

1. Redesign Alternative Processes for the Medical Procurement Process

The KOPeR redesign agent has diagnosed the faults within the current procurement process and provided redesign transformations that are most likely to effect dramatic improvement in the performance of the supply procurement process. The next step is to take these transformations and apply them to the baseline process model in order to generate dynamic redesign alternatives for the medical procurement process. [Ref. 21]

Drawing on phase five of Davenport's process innovation model, Designing and Prototyping the New Process, potential new processes can be developed using the information provided from KOPeR as a guide. Key activities of this final stage are restated in Table 3.3. This analysis is limited in scope to addressing the first two activities, brainstorming and assessing feasibility, risk, and benefit of design alternatives. [Ref. 4]

Brainstorming design alternatives
Examine feasibility, risk, and benefit
Selection of preferred process design
Prototype the new process design
Develop migration strategy
Implement new organizational structure and system

Table 3.3 Key Activities in Designing and Prototyping the New Process. [Ref. 4]

To begin, the authors held brainstorming sessions, which resulted in numerous redesign alternatives. After researching and working through several alternatives, some were tabled, and ultimately, it was decided that the best two redesign alternatives to discuss further are: 1) workflow system and 2) web-based end-to-end procurement solution. Both of these redesign alternatives are discussed below.

a. Redesign Alternative Process I

This first redesign alternative embraces the use of a workflow system concept. Workflow systems automate support process activities, enabling the automatic routing of work to the right person at the right time. [Ref. 20] The value added by automating the workflow of the current 1st Med Log Co procurement process is that the forwarding of required documents flows seamlessly from agent to agent (analogous to clerk to clerk.) In the baseline process, agents must physically forward required documents to the next agent's desk. By using a workflow system, letters concerning requirements, MROs, and procurement orders are transmitted electronically, streamlining the process and reducing overall cycle time.

Redesign I is outlined and diagramed (Figure 3.21 reflects) in the following paragraphs. Only those steps modified or deleted, indicated with shaded nodes, from the baseline process are discussed.

The first stage of the procurement process affected by the implementation of the workflow system occurs during Requirements Generation. Figure 3.21 depicts the workflow affected.

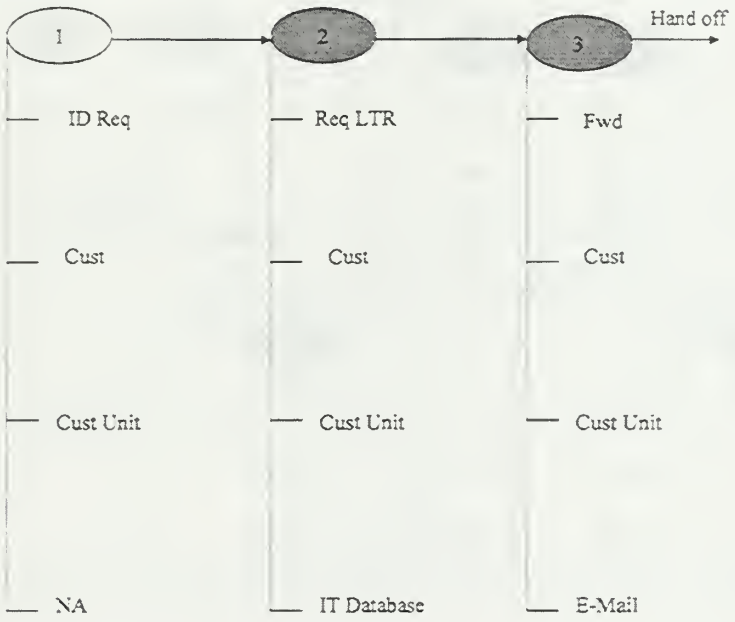

Figure 3.21. Requirements Generation.

Specifically, a workflow system would modify tasks two and three. During tasks two and three, the customer must generate and forward their requirements letter to the HSSO for action. Previously, the customer had to physically deliver the request to the HSSO office. As proposed in Redesign I, the requirements generation letter would be originated from a shared database and completed "on-line." It can then be forwarded electronically to the HSSO for appropriate action and drive the beginning of the next stage for the procurement process.

The next stage of the procurement process affected by the implementation of a workflow system occurs during Validation of Requirement. Figure 3.22 shows the workflow affected in the validation of requirement for Redesign Alternative Number I.

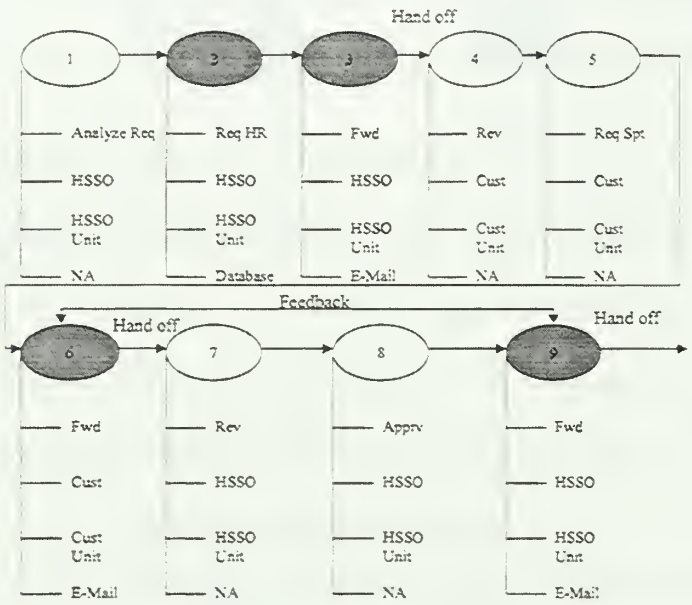

Figure 3.22. Validation of Requirements.

By implementing a workflow system, tasks two, three, six, and nine for Validation of Requirement stage can be modified. Previously, after the HSSO had completed the analysis of the requirement, a response letter was prepared and either sent back to the customer via the guard mail system or the customer had to physically retrieve this letter. By using a networked system and shared database, the HSSO and customer now interact with each other electronically, streamlining the process. This electronic exchange is duplicated in tasks two, three, six, and nine, replacing the physical transfer of the documents required for validation stage.

The next stage of the procurement process affected by implementing a workflow system occurs in the AMMAL Pre-Issue Activity stage. Figure 3.23 depicts the workflow affected during pre-issue for Redesign I.

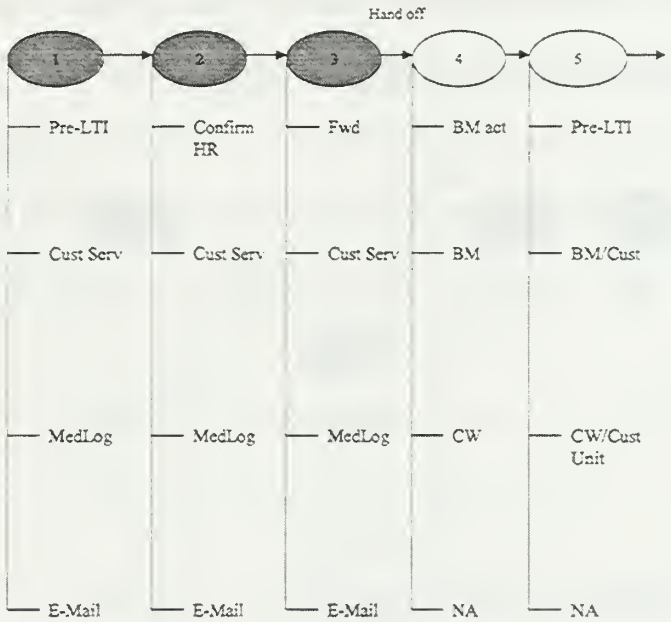

Figure 3.23. AMMAL Pre-Issue Activity.

The workflow system modifies tasks one, two, and three of the pre-issue activity. During task one, the Customer Service Section of the 1st Med Log Co makes contact with the customer to schedule a pre-LTI. With the networked system, the Customer Service Section suggests an inspection date and time and electronically forwards the request to the customer, who can also respond electronically. Previously, the Customer Service Section played phone tag to make contact with the customer and arrange an inspection date and time. Once the inspection date and time is confirmed, the Customer Service Section could then electronically forward the inspection confirmation letter to the appropriate Block Manager in the Contingency Warehouse. Previously in

task three, the Customer Service Section walked the paperwork over to the Contingency Warehouse.

The last stage to be affected by the implementation of a workflow system occurs during the AMMAL Post-Issue Activity. The workflow affected in the post-issue activity for Redesign Alternative Number I is depicted in Figure 3.24.

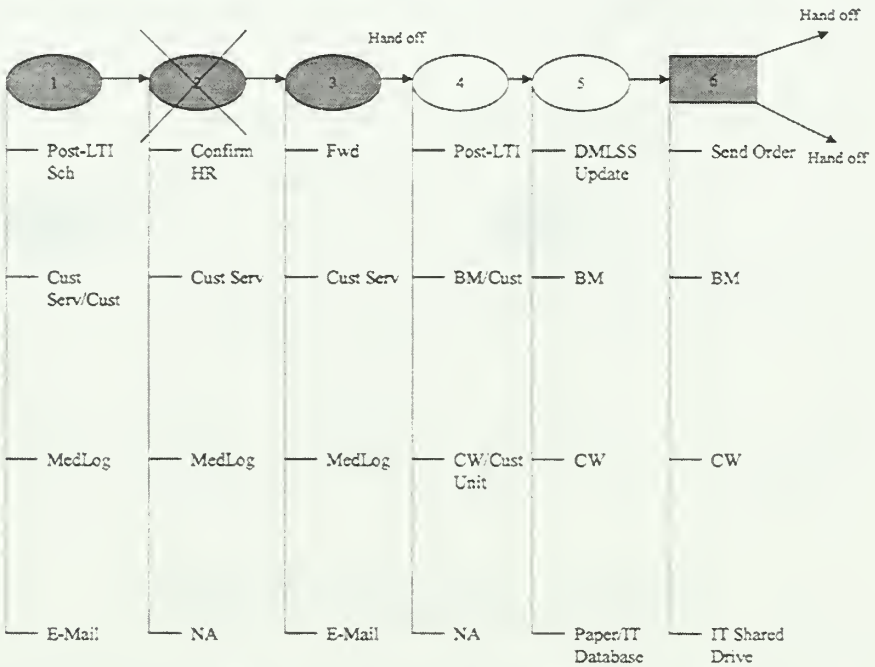

Figure 3.24. AMMAL Post-Issue Activity: Post-LTI Conducted.

Workflow implementation affects tasks one, two, three, and six. Previously, the Customer Service Section played phone tag to schedule the post-LTI. They would now perform this action electronically, by proposing an inspection date and time to the customer and send them an e-mail to confirm. The customer would respond electronically and the confirmation would be forwarded to the Contingency Warehouse for action. Once the post-LTI inspection is completed and the order is generated in

DMLSS, the Contingency Warehouse could electronically send the Customer Service Section a copy of the order for further processing. Previously, the Customer Service Section received a paper copy of the order that was used to generate appropriate charges to the customer. In a networked system, the Customer Service Section would receive the electronic copy from the Contingency Warehouse, perform the required processing tasks, and electronically forward the charges to the customer and the comptroller, vice forwarding a paper copy for further action. Figure 3.25 refers.

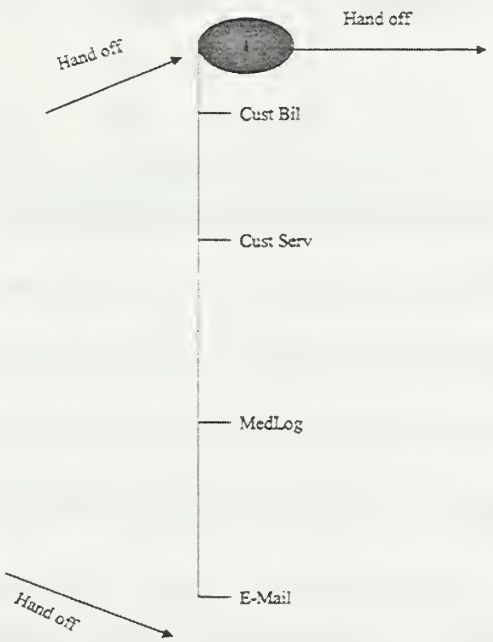

Figure 3.25. AMMAL Post-Issue Activity: Customer Billing.

Figure 3.26 shows how the implementation of a workflow system modifies tasks three, five, and seven. Previously, the Technical Review Clerk would print MROs based on orders submitted for further action by the Warehouse Section. The clerk now accomplishes this task electronically by forwarding the processed MROs to the Warehouse Section for further action. During task five, the Block Manager receives

electronic notification that supplies are ready to be picked up. At the issue point, the Block Manager electronically accepts the supplies. Previously, Block Managers signed for supplies only twice per week. In task seven, the use of a shared database allows the Block Manager to electronically share the listing of supplies that need to be received and appropriate inventory levels can be indicated for future updates. Currently, the Block Manager manually updates the inventory upon receipt and replenishment of supplies.

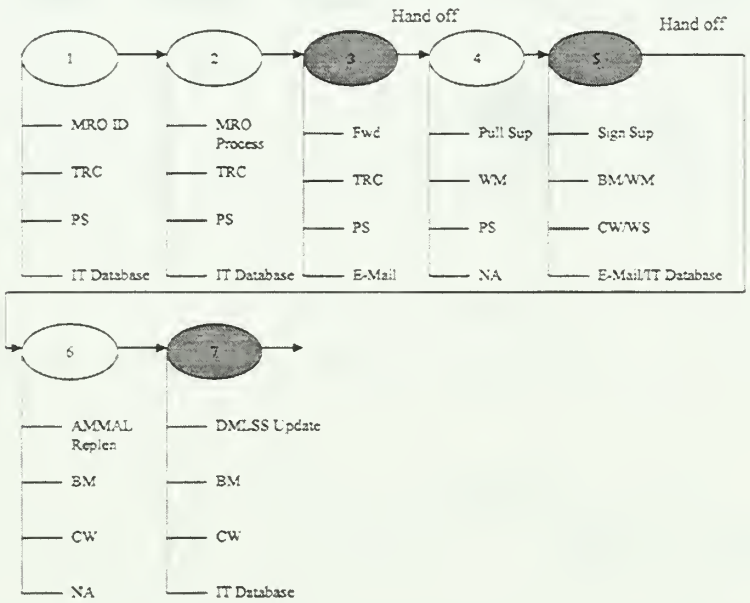

Figure 3.26. AMMAL Post-Issue Activity: MRO Identified.

Figure 3.27 depicts how the implementation of a workflow system alters the hand off of the buy list.

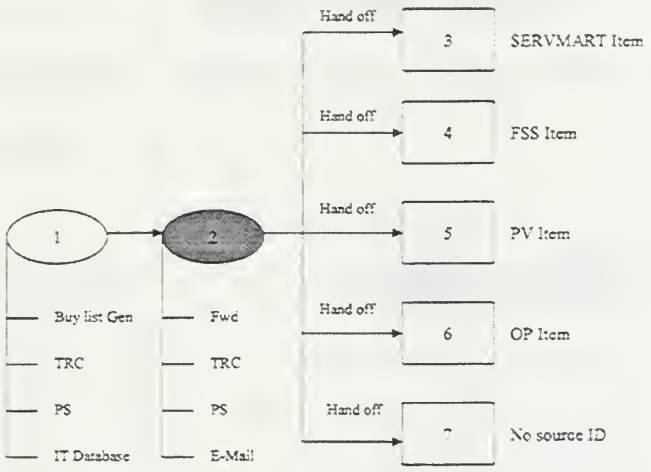

Figure 3.27. AMMAL Post-Issue Activity: Buy List Generated.

At present, the Technical Review Clerk processes the buy list and prints separate copies depending on which SOS were indicated by the system. Task two is affected by the implementation of a workflow system. Electronic copies of the buy list are now sent to each appropriate clerk for appropriate action. In turn, changes updating the buy list can be returned to the Technical Review Clerk in the same manner.

Figure 3.28 shows how implementing a workflow system alters the SERVMART processing.

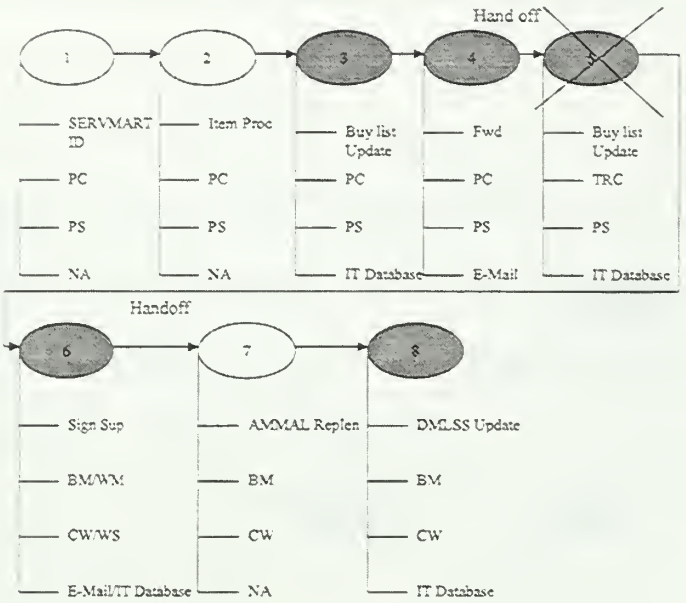

Figure 3.28. AMMAL Post-Issue Activity: SERVMART Item Identified.

In this system, tasks three, four, five, six, and eight are modified. Previously, the Procurement Clerk updated the buy list manually and handed off the updated version to technical review, which would then update ATLASS. With shared databases and e-mail, the Procurement Clerk would update ATLASS and send an e-mail to those who require notification of this action. In task six, the Block Manager is electronically notified that supplies are ready to be received and those supplies can be signed for electronically. In task eight, shared databases are utilized by the Block Manager to automatically update the inventory file for a particular AMMAL, vice having to manually update the inventory in DMLSS as they currently do.

Figures 3.29 to 3.35 depict the modification of the remaining tasks to be completed in the post-LTI stage. Previously, these tasks were physically forwarded from one agent to another for further action. Operating within a networked environment with

shared databases, each task is modified. Tasks are either electronically forwarded for appropriate action or when there is access to a shared database, the agent completes the required task themselves. E-mail notifying other agents that a task is completed would then be transmitted.

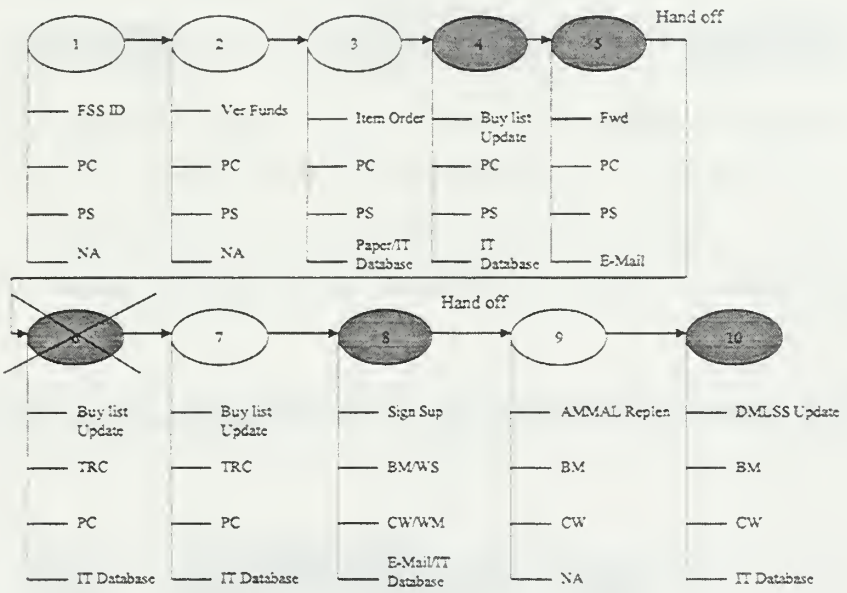

Figure 3.29. AMMAL Post-Issue Activity: FSS Item Identified.

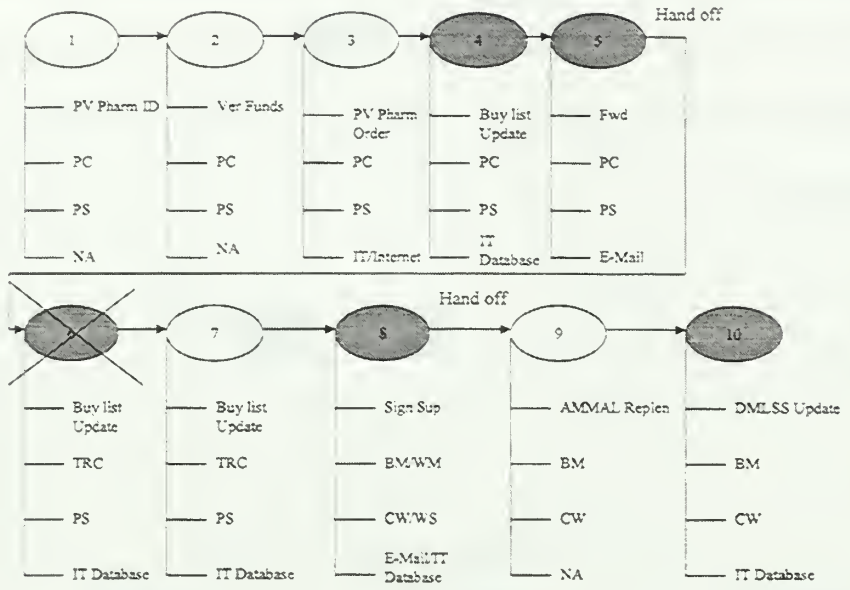

Figure 3.30. AMMAL Post-Issue Activity: PV Pharmaceutical Item Identified.

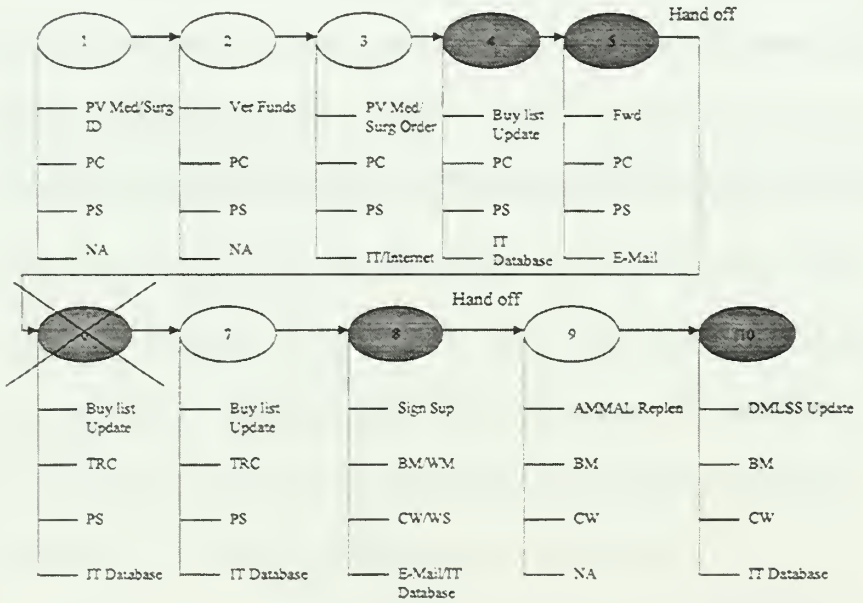

Figure 3.31. AMMAL Post-Issue Activity: PV Medical/Surgical Item Identified.

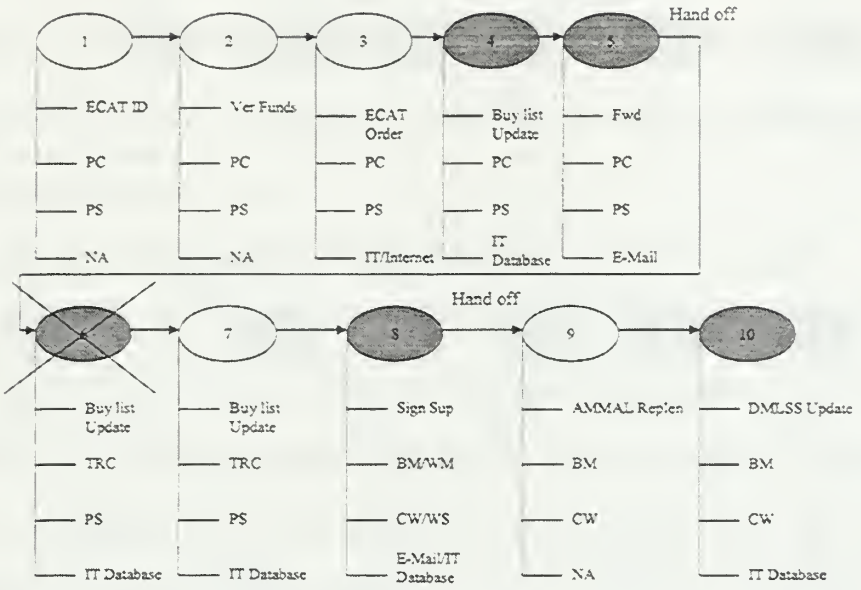

Figure 3.32. AMMAL Post-Issue Activity: ECAT Item Identified.

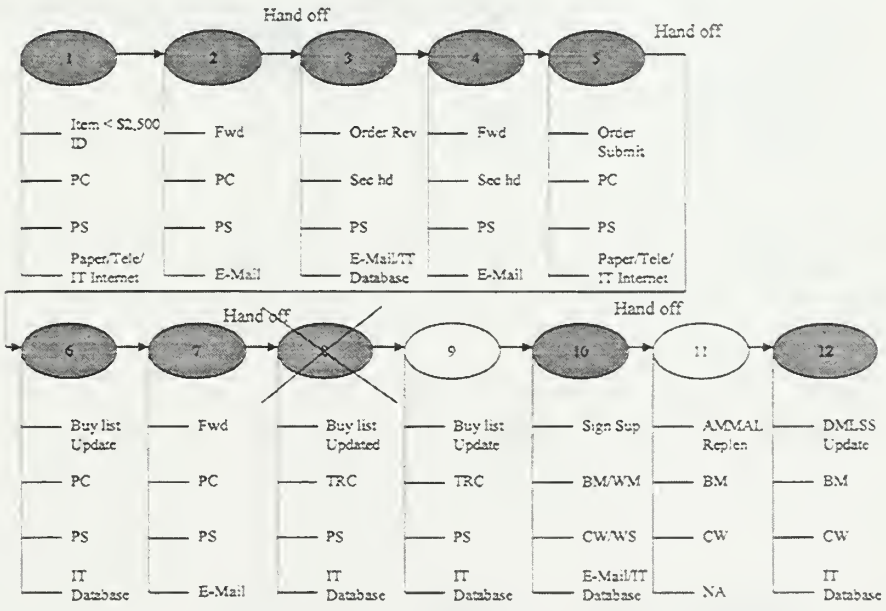

Figure 3.33. AMMAL Post-Issue Activity: Open Purchase Item <$2,500 Identified.

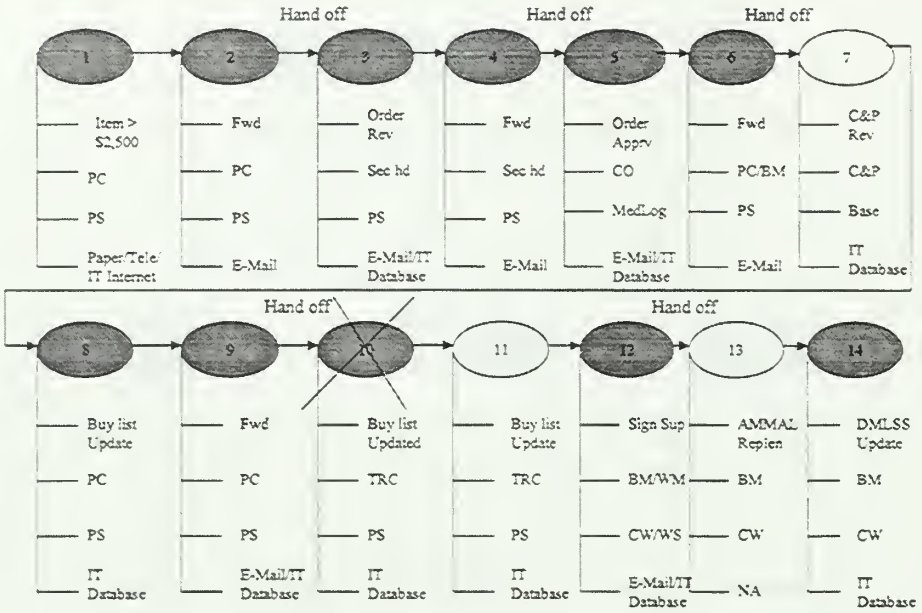

Figure 3.34. AMMAL Post-Issue Activity: Open Purchase Item >$2,500 Identified.

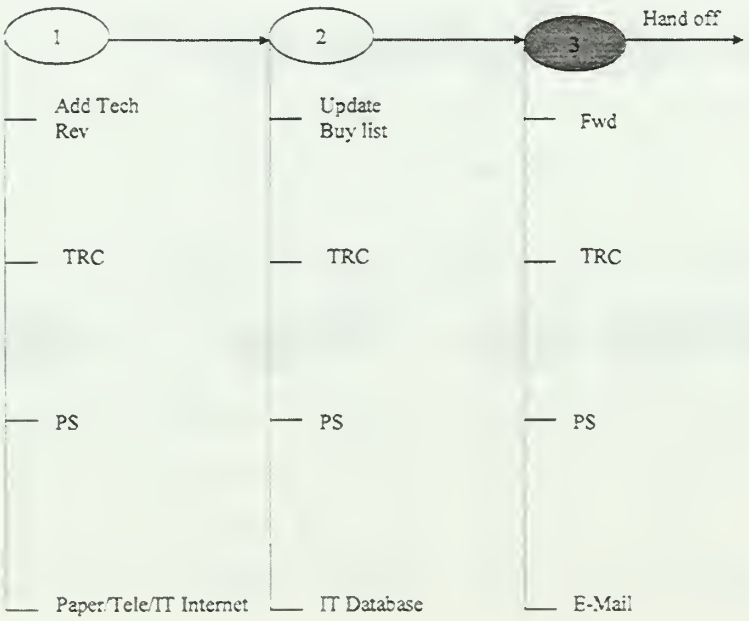

Figure 3.35. AMMAL Post-Issue Activity: No Source Identified.

After all of the steps mentioned before have been completed, the redesign process can be measured using KOPeR to provide a comparison between the "to be" process and the baseline "as is" process. Chapter IV details the resulting measurements, pathologies and possible outcomes.

b. Redesign Alternative Process II

With the advent of the Internet, new electronic commerce technologies have emerged vying for the opportunity to redesign existing supply chains. The health care industry as a whole is plagued with inefficiencies and needless expenditures that result from fragmented manual purchasing processes and tools. [Ref. 22] In the health care industry, approximately $24 billion is spent annually on supply chain costs; of that amount, $11 billion constitutes needless expenditures. Figure 3.36 provides a snapshot of the potential cost savings. With $8.5 billion spent on order management alone, there is a cost savings potential of approximately $2.7 billion.

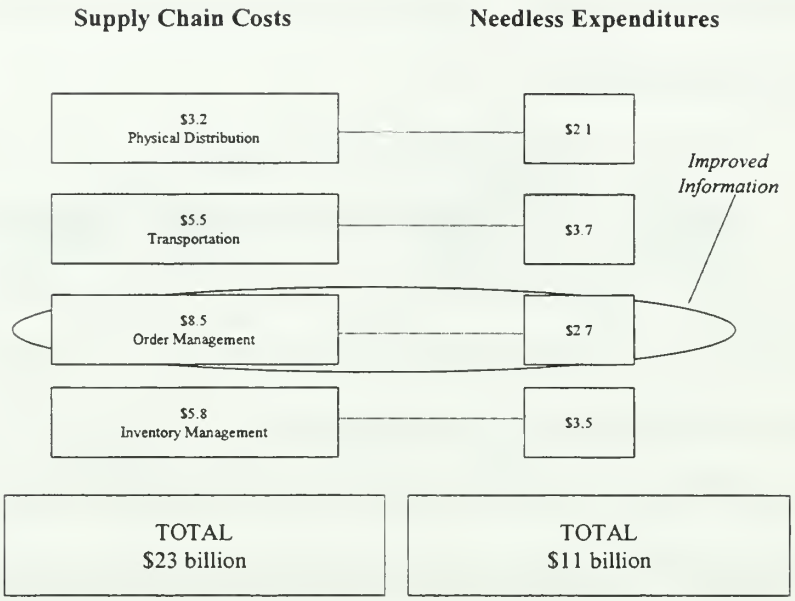

Figure 3.36. Potential Cost Savings in Health Care Supply Chain. [Ref. 23]

Procurement strategies utilized by many in the health care industry are at least two decades behind those of the grocery store industry. This lag is in stark contrast with the enormous progress made in the practice of medicine. Outdated purchasing tools in the health care industry include the use of paper catalogs, fax, phone, sales calls, forms, mail, e-mail, EDI, and individual vendor websites.

Electronic commerce (e-commerce) is a major, new business paradigm. From the rudimentary beginnings of EDI over 20 years ago, to the explosion of the Internet and the World Wide Web in the most recent years, new technologies promise only to quicken the pace and expand the horizon. [Ref. 24]

To better understand electronic commerce, it is helpful to point out the major changes in the business landscape that have occurred over the past 50 years. These changes are:

- *A change in IT.* We have progressed from business practices in which very little IT was available to one in which data communications, microcomputers, and Internet connections are affordable everywhere.
- *A change in the value chain.* We have progressed from an economy in which value lay in the physical goods we purchased or sold, to one where value now lies in the knowledge and information.
- *A change in the organizational structure.* We have progressed from an economy focused towards large, hierarchically structured organizations to smaller, task-oriented "virtual enterprises." [Ref. 24]

These three changes are intertwined, but it is believed that the fundamental driving force behind these changes has been the change in the IT available. IT has revolutionized the procurement process. The process has evolved from being seen as a purely clerical, operational, short term, single objective, reactive, and routine function to a networked, strategic, proactive, information intensive, and highly collaborative business function. [Ref. 25]

Still in its infancy, business-to-business (B2B) e-commerce is the fastest growth area in the superheated Internet economy. A Boston Consulting Group report estimates that Internet-based electronic business relationships will account for $2.8 trillion in sales by 2003. The Gartner Group places this figure even higher, at $7.2 trillion. [Ref. 22] E-commerce models in use today include link portal, distributor sites, catalog aggregation, proprietary networks, and open distributed systems.

A model that allows a buyer to go to a web portal and reach a supplier's site through a link is called a link portal. Purchasers must conduct individual transactions

with each supplier using this model, which may include multiple user interfaces, providing no single order mechanism. This model does not interface with legacy systems and the portal owner generally receives a commission for bringing the buyers and sellers together. [Ref. 22]

Distributor sites for e-commerce channel buyers to specific information. These sites currently do not interface with the buyer's legacy information system(s) and may use link portals to drive traffic. [Ref. 22]

Catalog aggregation imports data from buyers and sellers and hosts it on a web site. The host must update data on a routine and frequent basis for this information to be of value. This need for frequent updating can be costly and intensive. It does not fully integrate with the buyer's system and therefore is not a real-time system. [Ref. 22]

A B2B model that requires software installation and protocols is a proprietary network. Like EDI, it depends on trading partners using the same technology. This model is expensive to install, maintain, and generally requires an additional charge for transactions. [Ref. 22]

An open distributed system is another B2B solution. Acting as a neutral intermediary, the open distributed system does not drive business but sources data and information using Internet protocols for communication. The open model is platform independent and can be interfaced with buyer's and seller's legacy systems using technology such as enterprise application integration. [Ref. 22]

While purchasing supplies for the lowest price is always desirable, price alone is not the real driver of health care cost today. Electronic business hopes to

succeed through productivity improvements across the supply chain. Redesign II results from the incorporation of an end-to-end web-based procurement solution.

This alternative builds upon the workflow concept laid out in Redesign I, incorporating the modifications proposed in stages one through three, with stage four remaining unchanged. Stage five incorporates the implementation of an end-to-end web-based solution. For example, a neutral electronic marketplace vendor such as Medibuy.com, which specializes in efficient Internet B2B e-commerce solutions where health care buyers (e.g., 1st Med Log Co) can purchase, post, and negotiate requests for quotes or proposals, or participate in Medibuy.com's electronic catalog.

For the health care marketplace, Medibuy.com seeks to provide every service that a material manager may need so that there is no reason to go offline for any transactions. When all the procurement transactions take place in the exchange environment, Medibuy.com gathers data that its users (e.g. hospitals, clinics, and their suppliers) can use to analyze patterns in their procurement and selling processes. [Ref. 26]

The eCatalog developed by Medibuy.com aggregates information from any number of suppliers, anywhere on the Internet, and unifies this information into a single virtual catalog, enabling users to view real-time customer-specific pricing and product availability. After the order is electronically issued, buyers can be notified of order and shipment status. Key features of the Medibuy.com eCatalog system include:

- Point, click and buy ordering
- Multiple orders are split by line item and delivered to the appropriate supplier for real time order processing

- Offers a variety of search methods, including category, hierarchical, numeric, and key word searches
- Customers can access detailed product information, including data sheets and images
- Unlimited number of "shopping carts" (purchase orders by cost center) can be saved for repeat orders
- Data warehousing for customized reporting capabilities
- Users profiles and authorizations
- State-of-the-art security (128 bit encryption)
- Supports an unlimited number of ePorts throughout internal local area networks (LAN) or the Internet
- Provides buyers real-time access to a supplier's order processing system for viewing order status in a secure environment without manual intervention [Ref. 23]

Redesign II modifies the AMMAL Post-Issue Activity stage beginning at task four. Previously, the process to procure medical supplies that are required to replenish an AMMAL was highly segmented. By using an end-to-end web-based procurement process, time and effort that it takes to process an order can be significantly reduced. Once the user enters DMLSS, they would gain access to an assemblage management tool that contains an inventory management application. The information entered can be electronically integrated with the electronic marketplace, reducing the need for an end user to learn another inventory management application.

When the Block Manager completes a post-LTI using the package list as a source document, they open the appropriate AMMAL inventory and perform required updates. This is similar to opening a "shopping cart" for each AMMAL and then completing a "point and click" buy. Once the updating/shopping is completed, the Block Manager can automatically generate an order that the inventory program processes.

Subsequent notification of item availability in the Bulk Warehouse can be provided in a seamless fashion.

At the same time the Block Manager is notified what items are currently available, the Warehouse Section is sent e-mail notification that there is a new order to be processed. The Warehouseman gains access to ATLASS and prints the order. They pull the items listed on the order and update the warehouse inventory listing that the items have been pulled for AMMAL replenishment. Once completed, the Warehouseman notifies the Block Manager by e-mail that the supplies are ready to be received. The Block Manager would receive supplies electronically, replenish the AMMAL, and perform updates for the AMMAL inventory electronically with the receipt of supplies file that comes from the Warehouseman.

With the electronic marketplace's ability to aggregate buyer usage and provide varied analytical reporting, the buyer is able to forecast their usage, reset inventory levels, and reorder points based on identifiable trends or possible future commitments. Those items not immediately available from the Bulk Warehouse or those items that reach their reorder point are aggregated and forwarded to the Procurement Section for processing. Previously, different clerks processed replenishment orders for AMMALs and orders for items reaching their reorder point within the Bulk Warehouse by different means.

In Redesign II, the Procurement Clerk is notified by e-mail that there is an order waiting further processing. One Procurement Clerk would enter the marketplace web site and process the "shopping cart" order. Items listed on the inventory for each

AMMAL have a readily identifiable SOS already predetermined. AMMAL assemblages have a standard listing of required items. When the "shopping cart" for each AMMAL is built, the SOS is built into the system that controls the shopping carts. Examples of predetermined SOS include PV contracts and mandated sources of supply for DoD specific items. The clerk processes items that have predetermined SOS for further action. The supplier receives an e-mail stating that there is an order waiting further processing. The supplier processes the order and provides feedback electronically to the Procurement Clerk updating order status.

In the event that an item does not have a readily identifiable SOS, it is processed further by the marketplace, which notifies approved suppliers that there is an order for a certain item or items and that a buyer requests a quote on. The buyers also have the option of performing a search themselves. Once the SOS has been chosen, the buyer performs a "click and buy" from the chosen supplier. The supplier is electronically notified of a pending order, electronically processes that order, and in time electronically notifies the buyer of the order status.

With the electronic marketplace aggregating the customer's buying habits, the customer can potentially roll what were believed to be irregular purchases into their contracted PV catalog. This would greatly reduce the number of open purchases that are performed, while concurrently securing a potentially better price on the supply items. When the supplies are received and processed, the Warehouse Section would update the inventory listing of the bulk supplies through the ATLASS inventory management tool that interfaces with the electronic marketplace. The Block Manager is notified electronically concerning the item(s) now available that are required to replenish the

AMMAL. Receiving for the supplies electronically, the Block Manager replenishes the AMMAL and updates the inventory by importing a file of received supplies into the inventory. Figure 3.37 depicts the "to be" procurement process using an end-to-end web-based solution.

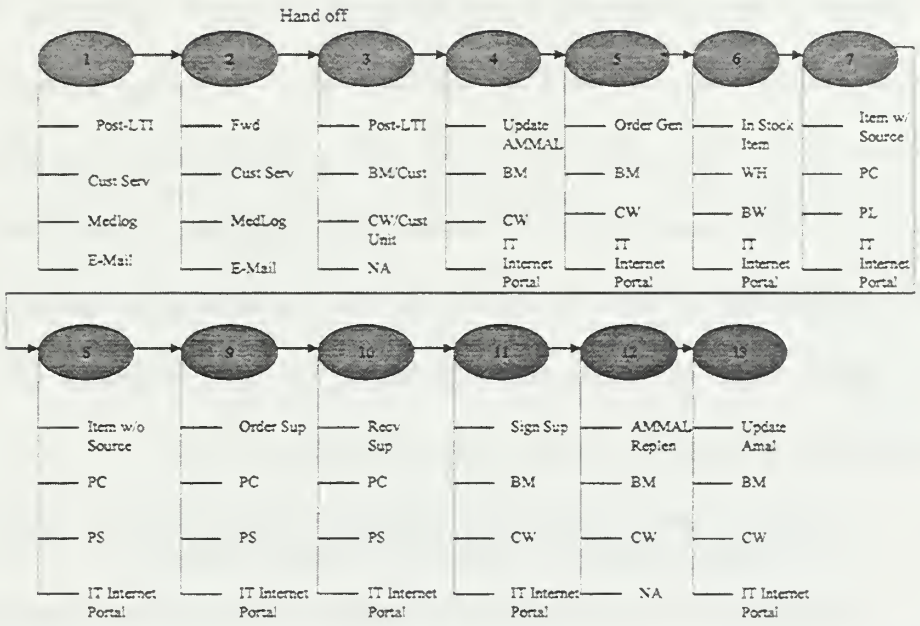

Figure 3.37. Procurement Process Using End-to-End Web-based Solution.

Specific measurements comparing the baseline "as is" process against Redesign II are detailed in Chapter IV. These measurements were obtained using KOPeR to diagnosis possible pathologies with the resulting "to be" process.

D. SUMMARY

KOPeR analysis of the medical procurement process has determined that the process is in need of streamlining. Two redesign alternative processes have been developed. With Redesign Alternative Process I, IT is formally introduced to the "as is" process by incorporating a workflow system. The implementation of this alternative

could be incorporated now into the procurement process, as a networked system is currently available. Measurements obtained from this redesigned process show that vast improvements in the procurement process can be realized by utilizing a workflow system that formally introduces IT to share information.

Redesign Alternative Process II incorporates the use of an end-to-end web-based procurement system (e.g., one such as Medibuy.com.) Procuring medical supplies through a neutral electronic marketplace vendor such as Medibuy.com is an option that is available today. Measurements obtained from this redesigned process show that the most significant process improvements can be realized when incorporating a workflow system process coupled with an end-to-end web-based "to be" process. A detailed implementation as developed by Medibuy.com consultants includes:

- Analyze current process and technology, transaction data and structure, and develop a project plan and implementation schedule
- Design future procurement plan, strategy testing, and data mapping
- Build process and data integration, perform integration testing, and procurement cycle testing
- Go-live full implementation testing and help desk support
- Improve by evaluating and monitoring performance, end-user feedback, and outcome measurement and process improvements [Ref. 23]

It is undeniable that the power of the Internet can take significant costs out of the currently inefficient health care supply chain. We are standing on the brink of a major shift in the fabric of business, a mass movement towards new forms of technology-enabled commerce. Organizations have three choices in how they prepare for the coming B2B storm. They can ignore the trends and leave their organizations unchanged. They may take half-hearted steps to adapt for Internet business, superficially altering their

organizations but leaving their core processes unchanged. Alternatively, they may recognize the tremendous opportunity offered by this paradigm shift, transform the way they serve their customers, and ensure their future in the digital age. [Ref. 27]

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IV. ANALYSIS OF THE REDESIGN ALTERNATIVE PROCESSES

In this chapter, each redesign alternative process presented in Chapter III is further analyzed to ascertain if the medical procurement process can be innovated. Each proposed redesign process is evaluated using the KOPeR methodology and compared to the baseline "as is" process. Strengths and weaknesses for each alternative are discussed, followed by an analysis of the positive implications and potential inhibitors that can cause success or failure for the redesign. Each potential inhibitor is discussed further to understand potential challenges that must be faced prior to implementing that alternative.

A. REDESIGN ALTERNATIVE PROCESS I

The first redesign alternative incorporates a workflow system into the medical procurement process. Workflow systems can support process activities using shared databases and networked communications, thereby allowing the automatic routing of work to the right agent at the right time, increasing overall process efficiency by using technology. [Ref. 20] Evaluating the redesign alternative process in terms of the measurements used in the KOPeR methodology is the first step. Table 4.1 lists KOPeR baseline measurements in comparison with the proposed redesign alternative process.

Measurement	Baseline	Redesign I
Process Size	116	108
Process Length	45	43
Handoffs	37	34
Feedback Loops	1	1
IT Support	39	49
IT Communication	0	35
IT Automation	0	0

Table 4.1. KOPeR Measurements of Redesign Alternative Process I.

Immediately, it is noted that a dramatic increase in the value of IT Communication occurs when choosing Redesign Alternative Process I. Measurements for IT Support also increase, reflecting that shared databases can be incorporated into the process, allowing agents to access information electronically vice resorting to using paper files or catalogs. For example, request and confirmation letters are created using a form letter and electronically forwarded from agent to agent. Agents thus avoid the time consuming process of creating paper copies, waiting for signatures, hand delivering copies, and making numerous telephone calls trying to make contact with other agents. Agents have the freedom to access and process information without the physical intervention of others. Databases are presently used in the process in a limited fashion and not in a shared manner.

Though agents presently use e-mail, it is not formally used as a tool in the procurement process. By formally introducing e-mail into the process, overall cycle time can be dramatically reduced by reducing the physical routing of all required letters, forms, and requests for AMMALs. Introducing IT Communication in the form of e-mail could allow 35 tasks to be completed electronically in this redesign alternative process vice zero in the baseline process. Table 4.2 details the resulting numeric measurements.

Measurement	Baseline	Redesign I
Parallelism	5.578	2.512
Hand off Fraction	0.319	0.315
Feedback Fraction	0.009	0.009
IT Support Fraction	0.336	0.454
IT Communication Fraction	0.0	0.324
IT Automation Fraction	0.0	0.0

Table 4.2. Comparison of KOPeR Measurements for Baseline and Redesign Alternative Process I.

Based on the measurements listed above, KOPeR's pathology diagnosis of Redesign Alternative Process I is as follows:

- Parallelism (2.512) – parallelism looks OK
- Hand off Fraction (0.315) – process friction
- Feedback Fraction (0.009) – feedback looks OK
- IT Support Fraction (0.454) – inadequate IT support
- IT Communication Fraction (0.324) – inadequate IT communications
- IT Automation Fraction (0.0) – IT automation first requires substantial infrastructure in terms of support and communication

When compared with the baseline "as is" process, Redesign I shows marginal improvement, but it exhibits the same pathologies affecting the baseline process.

1. Positive Implications

Factors that provide for increased efficiency and process performance in the application of the redesign alternative are known as positive implications. Readily available technology, minimal user impact, and reduced processing time are three positive implications of Redesign Alternative Process I. Each is discussed in turn.

a. Readily Available Technology

A KOPeR redesign recommendation is to increase IT Support and Communication within the process. A workflow system concept can be utilized to implement this recommendation and is one that can be implemented in a rapid fashion. Using e-mail and shared databases on a networked system can greatly enhance the procurement process flow within the 1st Med Log Co. Although the redesign alternative process is still inadequate, it can be implemented today. These tools are readily available and can be easily incorporated into the redesign process with minimal interruption, require a short learning curve, and the 1st Med Log Co already has the existing infrastructure in the form of a local area network (LAN.)

b. Minimal User Impact

The second positive implication of Redesign I is that user impact is minimal. The 1st Med Log Co process currently uses e-mail and databases on a limited basis. Both of these tools can be easily incorporated into the procurement process on a more formal basis by simply stating that this is how it will be done. Implementation of this alternative can formalize the use of IT Support and Communication for creating, processing, and responding to the required work documents of the medical supply

procurement process. By formalizing the use of e-mail and shared databases, the objectives of improving communication and increasing efficiency can be met. Minimal training is required for users who are not familiar with certain databases or the mechanics of attaching work documents to e-mails.

c. Reduced Processing Time

The third positive implication of Redesign I is that it can lead to a reduction in the procurement process cycle time. With the implementation of the workflow system concept, agents can electronically create and forward request letters, purchase documents, and funding documents, vice having to physically deliver these documents to numerous offices for approval and required signatures. What could potentially take several days to accomplish can be completed in minutes or hours, freeing agents to concentrate on more important or strategic tasks. By using e-mail and shared databases, process owners can be assured that the next agent in the process has received the required documents for action in electronic vice through the transmission of paper documents, which have the potential to be misplaced. Finally, agents can monitor the status of a required document at any time during the process by accessing the shared database instead of making phone calls or physically investigating where the document is to obtain status and perform needed updates.

2. Potential Inhibitors

Factors that reduce or suppress the potential gains of process innovation from the application of the redesign alternative process are known as potential inhibitors. Just as IT, organizational, or human factors can act as enablers of potential redesign alternatives for process innovation, they can just as easily become potential inhibitors. A process innovation initiative begins with a good understanding of who the customers of the

process are and what their desired outcomes are. [Ref. 18] The goal of process innovation is to strive for dramatic improvement of the process, working to resolve potential barriers to implementing the proposed process redesign. Potential inhibitors of Redesign I include IT, funding constraints, training, and organizational change.

a. Information Technology

With the increased dependence on information technology that is proposed in Redesign I, there is a greater potential of impeding the procurement process, when the IT systems are not functioning properly. Prior to implementation, the 1st Med Log Co must ensure that the requisite infrastructure is in place to facilitate smooth flow of the redesign alternative process. Additionally, procedures and operations for advancing the medical supply procurement process electronically need to be balanced with procedures undertaken if the networked system fails. A standard operating procedure must be established that closely mirrors the "to be" electronically driven process.

E-mail has been embraced by most members of DoD as an accepted and often preferred method of communication when sending and receiving documents of all types. Today, most members of DoD have some level of experience with computer use in general, most likely with word processing and e-mail applications. In previous years, DoD (and consequently, DoN) had no standard word processing or e-mail application programs. Applications varied from command to command and by location, requiring DoD members to have to be retrained in new applications if they transferred. Today, standard programs and formats are in place to allow for seamless operations between users, commands, and geographic regions.

Increasing dependence on IT requires that the 1st Med Log Co maintain use of the current standardized applications to minimize the impact that this redesign alternative could have on the overall procurement process. Along with increased dependence on IT comes a need for maintenance and an ability to upgrade both application programs and hardware to keep pace with changing technology. Proper maintenance of computer hardware and the ability to handle software issues will become vitally important with the implementation of a process that is technology enabled. By not keeping pace with technology, performing needed maintenance, and upgrades, the implementation of IT will hamper efforts to innovate and ultimately frustrate the process end-users.

b. Funding Constraints

IT based redesign alternative processes require significant infrastructure costs, initially to implement desired process innovations and over long-term periods. It is desirable to have supporting infrastructure in place prior to full implementation of a redesign alternative process based on IT. Full funding is needed to install the required hardware and software at the point of use in the "to be" frame work. At present, the "as is" process may not have the requisite IT infrastructure to support the proposed redesign alternative process.

Funding must also cover costs associated with continued maintenance, upgrades for networked systems, and personnel training. Without proper funding, IT associated process innovations can be viewed as being a hindrance for process end-users.

c. Training

As stated previously, most DoD members have at least a working knowledge of word processing and e-mail applications. With the implementation of Redesign I, initial and follow-on training on the proper use of these applications may be needed for personnel prior to implementation. A dedicated systems administrator would have to be assigned and properly trained to ensure smooth system functioning and enhance overall operational capabilities. Current manning levels do not indicate that the 1st Med Log Co has anyone assigned with this ability.

Proper maintenance of computer hardware and the ability to handle software issues will become vitally important with the implementation of a process that is technology enabled. Maintenance is a critical activity and if not performed in a timely fashion, a process that depends on IT for support and communication can be impeded or come to a complete stop.

d. Organizational Resistance

Redesign I proposes that agents involved in the procurement process change or alter the way they currently process information. In organizations where innovation and change are readily accepted, or ideally, where both are embraced, moving agents closer toward the needs of the customer does not involve resistance. Organizations that are slow to accept and implement change, or worse ones that try to reject attempts at change, will find it extremely difficult to understand and accept process innovation. In these types of organizations, ultimately the customer is the one who gains no advantage. A core organizational purpose of a customer service organization is to continually provide superior customer support, not just to eek by with minimal support.

Process innovation starts at the top of the organization, and for it to be effective, leadership must continually discover ways to motivate the rank and file to readily accept change.

As stated previously, the military is not an organization that readily accepts change. It is imperative that military organizations work toward embracing change, through initiatives such as process innovation. Current military leadership must also continue to adapt strategic policies that will enhance our ability to move forward into the 21st century. 1st Med Log Co leadership must overcome the stigma associated with change and realize that process innovation can enhance their operational capability and enable their organization to meet stated objectives of *Precision Logistics*.

3. Addressing the Inhibitors

The redesign alternative does not change the fact that the 1st Med Log Co must issue, replenish, receive and store AMMALs. Each member of the 1st Med Log Co must embrace current technological advances, employ practices that can improve their operational efficiency, and increase their ability to provide their customers with the required materiel. There should be a minimal need to perform initial training for 1st Med Log Co members on application programs such as e-mail because many Marines and Sailors have used e-mail previously, whether on the job or at home.

Senior leadership should receive initial training on the benefits that can be realized by undergoing a process innovation. Once trained and indoctrinated on process innovation, senior leaders can embrace the concepts and better understand their role. They will see why it is imperative for them to act as pivotal change levers for the process innovation and its subsequent implementation. As change levers, leadership can lobby

the chain of command for continued funding, personnel, training, and maintenance needed to support a process redesign that will improve IT Support and Communication.

Within the organization of the 1st Med Log Co, training should be completed for all, to define the process innovation methodology, highlighting the benefits that can be gained by undergoing an innovation, and what shortfalls may be experienced by an organization that does not correct fractured processes. This training should also highlight how the redesign alternative can make the organization more viable and efficient, increase role clarity, and minimize customer frustration with the process. By completing the redesign alternative, a fractured process can be improved with low adverse impact on the agents.

B. REDESIGN ALTERNATIVE PROCESS II

Redesign Alternative Process II incorporates the workflow system process proposed in Redesign Alternative Process I and enhances it by incorporating an end-to-end web-based solution. Again, the first step in analyzing the redesign alternative is to evaluate the process in terms of the measurements obtained from the KOPeR methodology. Table 4.3 lists the measurements obtained for Redesign Alternative Number II along with the baseline process values.

Measurement	Baseline	Redesign II
Process Size	116	31
Process Length	45	31
Handoffs	37	6
Feedback Loops	1	1
IT Support	39	4
IT Communication	0	12
IT Automation	0	9

Table 4.3. KOPeR Measurements of Redesign Alternative Process II.

When compared with the baseline process, the fractional measurements depicted in Table 4.4 are obtained.

Measurement	Baseline	Redesign II
Parallelism	5.578	1.0
Hand off Fraction	0.319	0.194
Feedback Fraction	0.009	0.032
IT Support Fraction	0.336	0.129
IT Communication Fraction	0.0	0.387
IT Automation Fraction	0.0	0.29

Table 4.4. Comparison of KOPeR Measurements for Baseline and Redesign Alternative Process II.

Based on the measurements above, KOPeR's pathology diagnosis for Redesign Alternative Process II is as follows:

- Parallelism (1.0) – sequential process
- Hand off Fraction (0.194) – handoffs look OK
- Feedback Fraction (0.032) – feedback looks OK
- IT Support Fraction (0.129) – inadequate IT support
- IT Communication Fraction (0.387) – inadequate IT communications
- IT Automation Fraction (0.29) – IT automation looks OK

1. Positive Implications

The positive implications for Redesign Alternative Process II include a significant reduction in the number of process steps and processing time (reducing overall cycle time), a reduction in process friction, minimal user impact, partnering with a neutral e-marketplace, reduction in total cost of the procurement process, increased IT Support, Communication, and Automation, and most notably, empowerment of agents. Each positive implication is discussed in turn.

a. Reduction in the Number of Process Steps

The first positive implication for Redesign II is the dramatic reduction in the number of process steps that need to be performed. In the baseline "as is" process, the total number of steps in the procurement process is 116. The first four stages of the medical supply procurement process are structured in a sequential manner. In stage five, by employing Redesign II, the number of steps decreases from 98 to 13. This dramatic reduction is the result of coupling an end-to-end web-based solution with a work system design.

Currently, the 1st Med Log Co has separate Procurement Clerks designated to perform numerous, disparate purchasing functions. There are separate clerks designated to process supplies for MROs, SERVMART, FSS, PV, and open purchase SOSs. With a web-based solution, one clerk can process an entire order for medical

supplies without having to leave the web site, thereby reducing the total number of steps that need to be completed and the time to complete them. The resulting "to be" process after implementing Redesign II, is only 31 steps long while the "as is" baseline process has a length of 45. (Table 4.3 refers)

b. Reduction in Process Friction

The next positive implication of Redesign II is the reduction in process friction. KOPeR recommended in its diagnosis of the baseline process that a case manager be employed to reduce the amount of friction in the process. In Redesign II, a case manager is the Procurement Clerk. With an end-to-end web-based solution, the Procurement Clerk has the authority, once an order is submitted, to execute all tasks to purchase the required medical materiel. This has the positive effect of reducing cycle time in the procurement process by eliminating the need for hand offs and departmental coordination (both internally and externally.) This is indicated in KOPeR's diagnosis of Redesign II, as the value for hand offs drops from 0.319 to 0.194, depicting a significant reduction in process friction.

c. Minimal User Impact

The third positive implication is that user impact is expected to be minimal. The 1st Med Log Co currently uses a minimal amount of IT Support through e-mail, databases, and the Internet for (supposed) efficiency, communications, and purchasing. These tools can be easily incorporated into the "to be" procurement process on a more formal basis with minimal impact. The implementation of this alternative can formalize the use of IT Support, Communication, and Automation for creating, processing, and responding to the required work documents of the procurement process.

Minimal training is required for users who are not familiar with attaching documents to e-mail, utilizing certain databases, and using the Internet to process purchase documents.

d. Partnering with a Neutral E-Marketplace

As of 22 August 2000, the total number of independent B2B exchanges offering medical materiel and other features to hospitals, non-acute care facilities, physicians, and nurses grew to approximately 70. This total does not include the myriad of web sites owned and operated by manufacturers, distributors, consulting firms, and media companies. E-commerce marketplaces in which group purchasing organizations or health care systems maintain an ownership stake or an exclusive contract are included in the total. Examples and major players of these partnerships include:

- Medibuy.com with newly acquired Empacthealth.com and Premier Incorporated and Health Trust Purchasing Group
- Neoforma.com and Novation
- Broadlane and Tenet
- AmeriNet Incorporated, MedCenterDirect.com and the Health South Corporation

This represents an overabundant number of marketplaces for executives and professionals in clinical resource and supply chain management to consider visiting or accessing on a regular basis. [Ref. 28]

The number of marketplaces that have been in existence for more than two years can be counted on less than one hand. Medibuy.com was one of the first firms to enter into the e-marketplace and is still in business today. Medibuy is a vendor neutral, buyer centric, responsive, and strongly financed organization with a seasoned executive staff. The firm acts as a neutral intermediary, bringing buyers and suppliers together. It

does not take possession of medical supplies, nor do they bill or receipt for payments of the supplies.

Recently, Medibuy.com has seen the shift in how organizations view e-commerce. At the beginning of the e-commerce revolution, many firms believed that they knew what e-commerce was and how it could benefit their organization. Currently, Medibuy (and many industry analyst) feel that firms are now concerned with better understanding how they can conduct e-commerce.

Medibuy.com is in varying stages of developing integration programs for approximately 25 major material management information systems that health care organizations use today. By seizing the initiative and developing these integration programs, Medibuy.com hopes to show health care organizations their knowledge, experience, and commitment to the buyer in incorporating their vendor neutral marketplace in the buyer's e-commerce solution. [Ref. 29]

The Naval Hospital Camp Pendleton completed a baseline study on using a neutral e-marketplace such as Medibuy to better understand the benefits and feasibility of partnering with Medibuy for procurement of medical materiel. Logistical personnel were impressed with the ease of using the web site and its content. One major barrier was the fact that many of the personnel who had roles within the procurement cycle were reluctant to try e-commerce, mostly due to lack of training on purchasing directly through the Internet. [Ref. 30]

e. Reduced Procurement Process Costs

Current procurement practices impose a heavy administrative burden on buying as well as selling organizations. Manual, labor-intensive, paper based purchasing

processes prevail in the vast majority of businesses in this country. Communication between buyers and suppliers is often conducted via phone or fax, requiring manual double entry of order information. It is estimated that only 15 to 30% of orders are transmitted by EDI, and EDI's usage tends to be concentrated mostly with larger buyers and suppliers. It is estimated that the average administrative cost per purchase order, from requisition to approval through generation of the purchase order, runs from $75 to 125. As health care has been lagging in terms of technology adoption, consistently spending less than 2% of revenue on IT for the past two decades, the administrative cost for health care is certainly within this general range and is likely toward the higher end. E-commerce can reduce these administrative costs significantly, by an estimated 60%, to as much as 95%. Subsequent costs would vary from a high of $30 to a low of $6 per purchase order. This cost estimate is a conclusion that was based on the experiences of numerous e-commerce customers. [Ref. 31]

Since health care organizations, as a whole, have been about embracing e-commerce, finding success stories within the health care arena are rare. One success story comes from BJC Health Systems of St. Louis, Missouri. BJC is comprised of approximately 100 facilities, including acute care, skilled nursing, corporate health, home care, and medical offices. It is one of the largest non-profit systems in the United States with net revenue of $1.9 billion, 2.8 million patient encounters, 4,572 licensed beds, 26,000 employees and over 4,000 physicians. [Ref. 32]

In order to make e-commerce a reality, BJC first needed to understand its current legacy system, incorporate the systems basic functionality and translate the corporation's basic core values into a change model by using the most revolutionary

business and technology tools available. BJC's transformation was composed of six stages. They were:

- Stage 1
  - Adopt and initiate an e-supply strategy
- Stage 2
  - Create internal connections
  - Internet enabled
  - On-line requisitions
- Stage 3
  - Connect with trading partners
- Stage 4
  - Join the exchange
- Stage 5
  - Complete the transactions
  - Purchasing cycle
- Stage 6
  - Manage/utilize data
  - Impact business operations
  - Impact patient care delivery

BJC's supply chain includes over 125 manufacturers, which constitutes 85% of where their annual supply chain spending. BJC is projecting $10 to 20 million in savings by using e-commerce with expected outcomes of lower supply costs, lower maintenance costs, accessibility, data aggregation, informatics, and personalization. To date, they have used e-commerce for 45 projects. Of the $12 million in bids posted via e-commerce, $4.7 million were awarded via e-commerce. BJC has documented $1.5 million in savings and turn-around time has been reduced from a range of 30 days to 12 months, to an average of 7 days to 6 months. [Refs. 29 and 32]

f. Increased IT Support, Communication, and Automation

Although still considered inadequate by KOPeR, the increased use of IT Support and Communication represents a positive implication for Redesign II. The

corresponding analysis presented in Redesign I remains consistent for use here. The increase in the automation of the process is one of the recommendations made by KOPeR. KOPeR suggests the use of intelligent agents that can enable e-commerce opportunities. Automation implies that IT is employed to perform process activities instead of people, and represents a different class of redesign transformation than either IT Support or Communication. [Ref. 20] With a neutral e-marketplace vendor like Medibuy.com, many functions that the purchasing clerks perform using multiple media can be performed seamlessly, using tools such as the electronic request for proposal tool. The clerk can input a request and the system can respond with subsequent proposals. Task automation streamlines the process, further reducing process friction.

g. Empowerment of Agents

The final positive implication discussed for Redesign II is empowerment of the user. With the increased use of IT Support, Communication, and Automation, the agent is empowered. Agents can have control over the ordering process, determining what supplier will fill the request by choosing the best value for the 1st Med Log Co and ultimately their customers. All authorized agents can have the ability to monitor order status, AMMAL inventory status, and warehouse inventory status. Previously, only Block Managers had knowledge of the AMMAL inventory status, only purchasing clerks had knowledge of order status, and only warehousemen had knowledge of warehouse inventory status. By sharing and understanding information, all agents can play a key role in contributing to the success of the procurement process.

2. Potential Inhibitors

The negative implications, possible inhibitors of Redesign II include all of the following and each will be discussed in turn:

- Those stated for Redesign I; IT, funding constraints, training, and organizational resistance
- Organizational resistance from the health care industry
- Legacy system integration
- Lack of e-commerce standardization
- Uncertainty of who should pay for e-commerce
- Uncertainty of e-commerce future
- Lack of e-commerce oriented strategic plan

a. Potential Inhibitors as Sated for Redesign I

As stated for Redesign I, IT, funding constraints, training, and organizational resistance can be seen as impediments to implementing Redesign II. The same factors stated before remain unchanged when applying them to this redesign alternative.

b. Organizational Resistance from the Health Care Industry

Just as DoD is sometimes resistant to change, so too is the health care industry. Changes that alter current business practices are looked upon with skepticism until they can be observed as a proven model with implementation potential. E-marketplaces offering medical supplies are competing to set standards that the industry can follow. By partnering with group purchasing organizations, which are tried and tested supply chain management alternatives, marketplaces hope to increase confidence in the e-commerce sector of the health care supply system. These industry leaders are seeking to show that even though the change in procurement practices can seem great, by developing a strategic plan for migration to this new process, health care organizations can step forward confidently into the e-commerce arena.

c. Legacy System Integration

E-marketplace integration with a health care delivery system's legacy system is perhaps the largest obstacle to overcome. Presently, it takes approximately one week to six months to develop an integration plan. [Ref. 29] Instead of attracting a hospital to join the marketplace and then developing their integration plan, marketplaces are now developing integration plans for approximately 25 of the major material management information systems in use and using those plans to attract hospitals.

d. Lack of E-commerce Standardization

Currently, there is no standardization when it comes to purchasing medical materiel on the Internet. This is due in part to inconsistency with standardization of medical products themselves. Some of the nation's largest group purchasing organizations and e-commerce companies recently formed a working group to develop industry standards for health care e-commerce. Consorta, Health Trust, Novation, and Premier joined with Medibuy.com and Neoforma.com to develop specific medical materiel protocols for the Internet. This group has targeted the following areas as their top priority:

- Continued implementation, assignment, and requiring that universal product numbers and health identification numbers be used throughout the industry by all
- Data classification
- Establishing catalog and transaction standards

Working group members are convinced that if they can agree on definitive medical/surgical and pharmacy catalog standards, the rest of the industry will follow and e-commerce will experience an order of magnitude increase. Efforts are also underway to ascertain what types of e-catalogs are in common use. By working together, these

major health care players are seeking input and feedback from throughout the industry to increase the probability of success for e-commerce standards.

e. Uncertainty of Who Should Pay for E-commerce

During the Association for Healthcare Resource and Material Management's (AHRMM) Annual Conference held from 13 to 16 August 2000, approximately 160 representatives from a variety of health care systems throughout the United States were posed a series of questions concerning e-commerce. One question was how did they think e-commerce should be paid for. Table 4.5 details the responses that were provided.

Response	Percent
Supplier transaction fees	33
Buyer and supplier transaction fees	16
Buyer transaction fees	2
One-time buyer paid installation cost	2
One-time seller paid installation cost	7
Both buyer and seller paid installation cost	15
All of the above	6
It should be free	18

Table 4.5. Survey Response – Who Should Pay for E-commerce. [Ref. 29]

As much as anyone would like e-commerce to be free for everyone, it cannot be. If an e-commerce business model is used that can capture savings for both the buyer and seller, it only makes sense that these savings be shared. This issue is something that the industry will have to resolve as e-commerce evolves. [Ref. 29]

f. Uncertainty of E-commerce Future

Another question posed to the 160 respondents of the e-commerce questionnaire at the AHRMM conference was that of the five e-commerce companies present (Medibuy.com, Neoforma.com, Omnicell.com, Promedix.com, and Medpool.com), how many did they feel would still be in business in two years. Table 4.6 depicts how the respondents felt with regard to this question.

Number of Companies Remaining	Percent
0 to 2	42
3 to 4	45
All	13
None	1

Table 4.6. Survey Response – Number of Companies Remaining After Two (2) Years. [Ref. 29]

Uncertainty abounds as to which companies will still be viable organizations in the future. When health care organizations evaluate an e-commerce company that they are considering partnering with, they should look for a seasoned professional staff, a solid business plan, financial viability, and a shared e-commerce vision. [Ref. 29]

HospitalNetwork.com recently visited and evaluated approximately 25% of the approximately 70 independent B2B online exchanges in existence. They wanted to identify and report some of the more useful features offered to users. What they found was that a significant number of sites are still in their billboard stages and some had no functional applications at all. Many sites offered only catch phrases about cost savings

and did not provide information about what the site really did or how it worked. To find such information, the user first had to register with the web site. Most buyers were reluctant to provide the requested information, especially when they had no idea how the information would be used and if by providing this information, would they actually receive anything of value. [Ref. 28]

Appendix B lists a sample of some medical supply e-commerce web sites informally evaluated by HospitalNetwork.com. Included in the appendix is a brief profile and descriptive summary of the site's navigational ease, content, and current business news deemed useful.

A field of 70 or so players seems much too crowded and it is inevitable that many companies cannot survive. A recent article in *The Industry Standard* discusses the migration of B2B e-commerce marketplaces to application service providers (ASPs.) These companies are taking their most marketable features and becoming ASPs with the ability to service one or more of the companies that will remain once this initial industry shakeout is completed and the industry moves into its adolescence. [Refs. 28 and 34]

g. Lack of E-commerce Strategic Plan

Many health care organizations do not presently have a strategic plan that speaks of e-commerce being a part of their overall vision. Without such a strategic plan, the organization is clearly in no position to implement an e-commerce solution. It is vitally important that an organization works to gain an understanding of where it currently stands with regards to e-commerce and benchmark their processes in order to evaluate present performance. A well managed e-commerce company will want to review this strategy with the health care organization, exploring the possibility that the e-

commerce company's proposition can be incorporated into that strategy and strengthen the organization's ability to manage its supply chain process.

3. Addressing the Inhibitors

Uncertainty concerning costs associated with e-commerce, the future of e-commerce, and lack of a dedicated strategic plan dealing with e-commerce represent the strongest potential inhibitors to the implementation of Redesign II. All stated databases must be linked to ensure functionality within the e-marketplace. This must be done completely prior to executing the proposed redesign alternative. Whether or not the 1st Med Log Co initially completes this database linkage as an in-house project or seeks assistance by partnering with a neutral e-marketplace vendor, senior leadership must be cognizant of the ramifications that can occur if the database linkage is not completed. Decisions pertaining to the complete course of action must be made up front and early.

DoD has developed a corporate level strategic plan to deal with emerging commercial business practices such as e-commerce. This vision should be translated into the 1st Med Log Co's strategic plan. At the 1st Med Log Co level, both short-term and long-term visions that incorporate e-commerce, as an enabler need to be communicated through the required chain. The 1st Med Log Co's plan should ideally focus on issues dealing with benefits and shortfalls associated with improving areas such as IT support, communication, or automation.

Senior medical logisticians at the DoD level (for example, at. Marine Corps Logistics Command and NMLC) can aid this process by embracing end-to-end web based methods as potential means to increase and improve supply chain efficiencies, reduce operational costs, decrease the medical logistical foot print, and a way to empower

end-user who will gain more control over the process. The resulting strategic plan should also include provisions for incorporating all legacy systems currently in use in the "as is" process. This step may require assistance from higher authority (such as DSCP) or the neutral e-marketplace vendor but is one that should not be overlooked. By not bringing the stored, historical information contained within those legacy systems forward, the resulting site-specific e-marketplace can be hampered, and will not contain enough information to perform key missions such as demand forecasting.

All conclusions previously mentioned concerning Redesign I remain unchanged.

C. SUMMARY

Davenport's analysis of the redesign alternatives for the procurement process provides positive implications of each alternative and addresses potential inhibitors. KOPeR reduces the inherent risks of reengineering the procurement process by projecting and analyzing each critical performance characteristic of the "to be" alternative redesign process and pathology against the "as is" baseline process. By completing KOPeR measurements, redesign alternatives that appear viable and fruitful on the surface can be examined prior to implementation to uncover inherent pathologies. Those providing dramatic process improvements can be implemented and ultimately save an organization both time and money.

In Redesign Alternative Process I, analysis shows that positive implications appear more significant than the stated potential inhibitors; supporting the fact that implementation of the redesign alternative can be completed now.

Analysis of Redesign Alternative Process II shows that some of the technology needed to implement the redesign process is available today, but legacy systems will

require an integration plan before full implementation can be accomplished. Once developed this redesign alternative process can significantly streamline and automate the procurement process.

Together these two redesigns offer considerable promise in terms of dramatic performance improvement. In particular, Redesign II suggests substantial improvements in cost, cycle time, and quality. Yet KOPeR suggests the process has room for further improvement. This is noted as a fruitful topic for future research. Chapter V discusses recommended courses of action derived from the analysis of both redesign alternative processes and provide recommendations for further areas of study.

V. CONCLUSIONS, RECOMMENDATIONS, AND SUGGESTIONS FOR FUTURE RESEARCH

This chapter presents conclusions, recommendations, and suggestions for future research.

A. CONCLUSIONS

The primary purpose of this research was to address problems and identify limitations within a Med Log Co's procurement process and to explore methods of improvement using a process innovation approach. A literature review provided background information on the medical procurement process and process innovation methodology. Site visits were conducted at the 1st Med Log Co, Supply Battalion, 1st FSSG, Camp Pendleton, California, the Naval Hospital, Camp Pendleton, California, the Community Hospital of the Monterey Peninsula, Monterey, California, and the corporate headquarters of Medibuy.com, San Diego, California. These visits were conducted to acquire baseline information on existing procurement methods practiced at these entities. Interviews were conducted with a variety of key personnel, including Material Managers, Procurement Clerks, Warehousemen, and Government Account Representatives.

Documenting the process flow of the medical procurement process provides an understanding of the "as is" baseline process currently in use. Using KOPeR to analyze the current medical procurement process provided the framework for the development of two potential redesign alternatives presented in Chapter III. In Chapter IV, the positive implications and potential inhibitors for success or failure for each redesign alternative process were presented.

According to U.S. Marine Corps doctrine, a Med Log Co is an organizational unit designed to receive, store, maintain, and issue the right medical supplies and equipment, to the right customers, at the right time. The process of procuring medical materiel has evolved over time, from one in which DoN manufactured its own medical supplies, to military services procuring medical supplies from defense supply depots, to the present system where military services procure materiel from numerous sources of supply.

Precision Logistics calls for all Marine Corps logistical activities to examine their current practices to ascertain the value of their "as is" processes and undertake proven initiatives that can lead to improvement of their existing processes. In the current state of military logistics, it is critical that logisticians know what and where their assets are in order to provide line commanders with information on status that is timely, accurate, and readily available. Initiatives such as the PV program have caused a dramatic improvement in efficiencies associated with the existing procurement process. Another key initiative is the VMI program currently being tested at the 2nd Med Log Co, Camp Lejeune, North Carolina. It is strongly believed that the VMI initiative will further increase procurement process efficiency, show that inventory reductions are possible in both garrison and operational settings, and that the potential for long-term cost savings exists.

Using KOPeR to analyze and diagnose the "as is" baseline procurement process, we sought to verify that this process could lend itself to the concept of process innovation. Based on the resulting KOPeR diagnosis, two plausible redesign alternative processes were developed to reflect the formal injection of IT into the "as is" process.

Redesign Alternative Process I incorporates the use of a workflow system and formally introduces IT into the "as is" baseline process. A significant benefit of Redesign I is that it can be implemented now with minimal cost and time investment. The infrastructure required to support the use of e-mail and shared databases is already in place throughout DoD. Potential inhibitors for this alternative are a greater dependence on the use of IT, funding constraints, training, and organizational resistance, which through proper planning can have a minimal impact on the process.

Redesign Alternative Process II incorporates the use of an end-to-end web-based procurement system along with the use of a workflow system design. This alternative requires analyzing and focusing on what their current "as is" procurement process is, assessing the myriad of medical materiel e-commerce marketplaces, and choosing a marketplace that understands and shares the strategic e-commerce vision of the organization. The marketplace and organization can work together to analyze, design, build, implement, and improve their "as is" baseline process by innovating their existing legacy logistical ordering system.

By analyzing current methodology and ordering processes, the marketplace and organization will ensure that both have an understanding of existing technological infrastructure, present limitations, transaction data, data structure, and will develop a plan for the future structure of an end-to-end web-based procurement system. Future procurement processes can be documented by performing data mapping and strategy testing to help shape a final design.

Prior to going live and fully implementing a final design, integration and procurement cycle testing can be completed to test the resulting "to be" process. During this testing, both parties should ensure that full process and data integration occur at every step of the newly designed process. Key factors such as ensuring that there is help desk support should be factored into the development of an end-to-end web-based procurement system. Once testing has been completed and all parties are satisfied that process and data integration are correct, the organization can go-live and complete implementation.

The process innovation methodology includes the requirement for the end-user to evaluate and monitor performance of selected and implemented redesign alternatives. In this vein, if an end-to-end web-based procurement system is chosen, the organization must clearly define its evaluation parameters, delineate specific, yet realistic outcome measurements, and monitor the performance of the selected marketplace. Both the marketplace and organization should provide each other with feedback, especially from the end-users of the system.

Once an integration plan is developed and implemented, it can significantly streamline and automate the medical procurement process. Significant inhibitors are those stated for Redesign I, organizational resistance from the health care industry, legacy system integration, lack of e-commerce standardization, uncertainty regarding who should pay for e-commerce, uncertainty of e-commerce future, and lack of e-commerce oriented strategic plan to guide the organization.

KOPeR analysis of the redesign alternatives presented for both alternatives is extremely positive. The combination of literature review, site visits, interviews, and process analysis supports the idea that the current medical procurement process can be made more effective, efficient, and user friendly by utilizing the enablers discussed for each of the redesign alternatives presented. This study concludes that there are two possible redesign alternatives available that can directly impact the "as is" process for the 1st Med Log Co. Both will provide the most immediate impact for improving their "as is" procurement process. Further research and testing may yield further redesign alternatives that can further innovate the process.

Although both redesign alternatives presented offer the potential to improve the procurement process, Redesign II clearly reflects Davenport's philosophy concerning process innovation. Recall that Davenport states that process innovation implies a radical change of the process, requiring the process owner to start with a clean slate and work toward a new "to be" process through the use of a benchmarking tool such as KOPeR. A process improvement is an incremental change of the existing process; it can yield only small changes and should not be confused with process innovation, a change agent that is results driven and one that seeks to make dramatic improvements to the entire process.

Redesign II clearly reflects Davenport's process innovation thinking of streamlining the process in order to make it more efficient and effective. This redesign alternative focuses on empowering the users by providing access to shared databases and an end-to-end web-based procurement system to procure medical materiel quickly and efficiently. It also focuses on automating the process, which further reduces the amount of friction. Lastly, Redesign II uses a case manager concept, empowering the end-user

who can control the tasks involved in purchasing medical materiel from receipt of an order to receipt of supplies, further streamlining the process. Redesign II confidently provides a plausible innovative solution to the 1st Med Log Co's procurement process.

B. RECOMMENDATIONS

Based on the conclusions of this research, the following recommendations are made:

- The 1st Med Log Co should modify its current medical procurement process by implementing Redesign Alternative Process I. By formally introducing IT, in the form of e-mail and shared databases into the "as is" process, immediate efficiencies can be achieved. Redesign I will allow for streamlining and elimination of several time consuming steps and because this alternative can be affected using technology that is currently in place, it should be implemented first.
- Efforts should be undertaken to implement Redesign Alternative Process II to realize further process innovation. Once IT has been formally introduced and the resulting infrastructure has been placed, movement to Redesign II can be accomplished. Med Log Co leadership can perform a limited study to ascertain feasibility and work with a neutral e-marketplace to find a desired e-commerce solution. The time and effort to establish a concrete relationship with a neutral e-marketplace vendor may be lengthy and wrought with bureaucratic hurdles. However, the value added by incorporating an end-to-end web-based solution as proposed with Redesign II, when coupled with Redesign I, is enormous. Process streamlining that results from this web-based solution will have positive impacts not only at the Med Log Co but also with its customers. Above all else, by implementing Redesign II, the Med Log Co can realize immediate order of magnitude increases for both efficiency and operational cost savings.
- All Med Log Cos should work toward developing a standardized procurement process by completing a process innovation similar to the one performed at the1st Med Log Co. By undertaking this recommendation, the COs for the Med Log Cos can seek to set the standard for the 21st century. Actively engaging in process innovation at the unit level will greatly enhance the Med Log Co's ability to provide the warfighter with the right material at the right time, complete required mandates for *Precision Logistics,* and ultimately satisfy the requirements as stated for *Focused Logistics*. Each unit should entertain an initiative to standardize procurement processes by seeking to diagnose existing pathologies with their "as is" baseline processes and consider formally introducing IT

methodologies that will improve their operational efficiency. IT can enhance and tremendously improve the current process today.

C. SUGGESTIONS FOR FUTURE RESEARCH

Several areas that are beyond the scope of this research project were discovered during this study. The following were selected as being most crucial at this time. Each area is presented below as a question, followed by a brief discussion.

- Is there an initiative on the horizon to study, define, and mandate new requirements concerning inventory levels for AMMALs being held at a Med Log Co? Current Marine Corps doctrine requires that a Med Log Co maintain 45 days of supply for associated AMMALs (for each AMMAL assigned.) AMMAL use at the 1st Med Log Co reflects that usage does not exceed 67.13% overall for all AMMALs held. (Appendix C refers). In today's logistical world, holding and moving large logistical footprints is not viewed as practical or cost effective. Presently, there is a strong emphasis being placed on the concept of rapidly deploying troops with a decreased overall footprint and theater logistical requirements. Logistical leadership at the Marine Corps level, in conjunction with senior medical logisticians, should aggressively examine the present doctrine that requires 45 days of supply be held in garrison. Consideration should be given to the concept of increasing the use of prepositioned ships (which maintain an additional 15 days of supply) and VMI trials being completed. Simulation and modeling should be performed jointly with the Med Log Co and key vendors to ensure critical items are available when and where needed. Once data has been gathered and examined, the procurement process can be further defined and innovated, in concert with doctrinal changes. Doctrine should also reflect the use of proven initiatives, such as PV, which allow the Med Log Cos to reflect better business practices used in the commercial sector.
- Will initiatives such as automated identification technology aid with the management of AMMALs? AIT, using items such as radio frequency tools and bar code technology (existing and developing), promises to enhance many areas of logistics, including ordering, storage, shipping, and receiving. DoD transportation leaders are investigating potential associated with AIT use in the transportation setting because of its success in the commercial sector. Hopefully, with further research, similar initiatives can be translated further into supply chain management activities that can improve existing in-house processes at the end-user unit level (such as a Med Log Co.)
- Is there a plan to integrate current legacy systems being used by the Med Log Cos so that there is one standard information system being used to manage medical materiel? One IT system should be used by all three Med

Log Cos to provide for a seamless transition between the Med Log Cos and potentially during any MTW or MOOTW. Senior logistical leadership within both the Marine Corps and BUMED should come to agreement on which system would provide optimal effectiveness for all three Med Log Cos. Ideally, this agreement would come with full funding to promote system sustainability. It is understood that systems such as DMLSS and ATLASS represent sunk costs to DoD. Instead of trying to make costly changes to these legacy systems, there should be research on how to enhance these systems and gain benefits that can be realized by all within DoD. By using one system, the enhancement and efficiencies associated with operational effectiveness will be great. If an end-to-end web-based procurement system is used to further enhance the surviving system, any efficiency realized from using a single information system can only increase.

- Will improving the procurement process increase the Med Log Co's ability to increase their data mining capability and allow for better supply chain (inventory) management? The capability to manage the data that your IT system provides is paramount to successful supply chain management. Current processes do not allow for efficient data mining. By increasing and improving the IT currently used, the ability to manage the supply chain will be vastly improved and allow for better results when completing planning endeavors.

APPENDIX A. AMMALS ASSIGNED TO THE FLEET MARINE FORCE

0618	FLEET MARINE FORCE	LABORATORY EQUIPMENT
0619	FLEET MARINE FORCE	LABORATORY CONSUMABLES
0627	FLEET MARINE FORCE	X-RAY EQUIPMENT
0629	FLEET MARINE FORCE	PHARMACY EQUIPMENT
0630	FLEET MARINE FORCE	PHARMACY CONSUMABLES
0631	FLEET MARINE FORCE	SHOCK SURGICAL TEAM/TRIAGE EQUIPMENT
0632	FLEET MARINE FORCE	SHOCK SURGICAL TEAM/TRIAGE CONSUMABLES
0633	FLEET MARINE FORCE	ACUTE CARE WARD EQUIPMENT
0634	FLEET MARINE FORCE	ACUTE CARE WARD CONSUMABLES
0635	FLEET MARINE FORCE	AID STATION EQUIPMENT
0636	FLEET MARINE FORCE	AID STATION CONSUMABLES
0637	FLEET MARINE FORCE	PREVENTIVE MEDICINE EQUIPMENT
0638	FLEET MARINE FORCE	PREVENTIVE MEDICINE CONSUMABLES
0639	FLEET MARINE FORCE	OPERATING ROOM EQUIPMENT
0640	FLEET MARINE FORCE	OPERATING ROOM CONSUMABLES
0649	FLEET MARINE FORCE	X-RAY CONSUMABLES
0662	FLEET MARINE FORCE	FIELD DENTAL OPERATORY
0684	FLEET MARINE FORCE	MEDICAL LOGISTICS MISSION/GEOGRAPHIC
0685	FLEET MARINE FORCE	MEDICAL LOGISTICS MISSION/GEOGRAPHIC
0686	FLEET MARINE FORCE	MEDICAL LOGISTICS MISSION/GEOGRAPHIC
0687	FLEET MARINE FORCE	MEDICAL LOGISTICS MISSION/GEOGRAPHIC
0688	FLEET MARINE FORCE	MEDICAL LOGISTICS MISSION/GEOGRAPHIC
0691	FLEET MARINE FORCE	MEDICAL LOGISTICS EQUIPMENT TEST & REPAIR EQUIPMENT
0692	FLEET MARINE FORCE	MEDICAL LOGISTICS EQUIPMENT TEST & REPAIR CONSUMABLES

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APPENDIX B. MEDICAL E-COMMERCE COMPANY SNAPSHOTS

Company Name: Neoforma.com, Incorporated
Web Address: neoforma.com

Profile: Site is set up to be a one-stop e-commerce site. Website offers an array of shopping, planning, and equipment auction capabilities.

Navigation: The site is well organized and easy to navigate.

Content: The Neoforma site offers two useful and unique features. First, it combines Internet capabilities with more traditional functions to create a truly comprehensive end of life cycle equipment management program. Second, the Neoforma Plan function allows the user to have an online panoramic view of a construction or build-up project that might be similar to what they are contemplating. Neoforma was started on this foundation. Soon after, the firm was exploring the value of a purchasing function, which is now known as Neoforma Shop. This function provides easy to use tools for locating, pricing, and purchasing a wide array of medical products.

Current Business News: Neoforma's stock has been slumping in the last few weeks amid news of a second round of layoffs. Industry insiders also point to a rumored cash crunch as one of the challenges. Neoforma and Novation, its group purchasing organization partner, have been working to get the service introduced to the alliance's hospitals and suppliers.

Company Name: Medibuy.com, Incorporated
Web Address: medibuy.com

Profile: The Medibuy site is designed to offer a gateway to product purchasing and equipment management.

Navigation: Site design is appealing to the eye and is easy to navigate.

Content: Medibuy's most useful features include the eRFP, a versatile and extremely useful tool for locating price and availability for any product in Medibuy's product universe. A user can quickly build and send out an RFP for a product and have responses back in a short time, often within a few hours. This one feature alone strongly addresses one of the most time consuming and expensive activities performed by hospital purchasers, finding pricing and availability for low or occasional use products. Medibuy also has several components in place for what will be its asset life cycle management program. This site is fully functional.

Current Business News: Medibuy recently announced that it was acquiring Empact Health. This acquisition is seen as a bolster to Medibuy's prospects especially when added to the relationship it has already established with its alliance with Premier Incorporated.

Company Name: Medpool
Web Address: medpool.com

Profile: Medpool's focus is on targeted bidding of products and product groups.

Navigation: Straightforward and easy to navigate.

Content: Medpool's primary service combines the concept of committed volume, spot buying, group purchasing, and buyer anonymity with the power of the Internet to provide its users with the opportunity to obtain the best price currently available for any product it bids.

Current Business News: None available.

Company Name: Promedix
Web Address: promedix.com

Profile: Promedix focuses solely on specialty medical products.

Navigation: An easy to navigate pure purchasing site that is organized according to the steps required to complete the purchase.

Content: This site has an excellent tutorial available on its home page that walks the user through each step along the way if they are unfamiliar with using e-commerce on the Internet. Promedix has the capability to link its service with the customer's materials management information system or enterprise resource planning system.

Current Business News: None available.

Company Name: MedCenter Direct
Web Address: medcenterdirect.com

Profile: This site offers tools to make procurement and product management efficient and provide useful information to the user.

Navigation: Logically organized and easy to navigate.

Content: MedCenter Direct moves deeper into the acute care organization's procurement processes with a tool called the Preference Card. This tool is a

system that coordinates specific clinical procedures with the supplies required to perform them. It allows the user to track product usage and facilitates timely and accurate replenishment.

Current Business News: MedCenter Direct has recently formed a very powerful relationship with Health South Corporation.

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APPENDIX C. 1ST MED LOG CO AMMAL USAGE FOR FYS 1998 TO 2000 (TO DATE)

Number	Nomenclature	Number of lines	Total on hand	FY 1998 usage	FY 1999 usage	Avg number used	Percent used/year	FY 2000 (Oct to Jul) usage
0618	Laboratory Equipment	139	13	7	7	7	53.85	2
0619	Laboratory Consumables	66	13	7	7	7	53.85	2
0627	X-ray Equipment	13	13	7	8	7.5	57.69	2
0629	Pharmacy Equipment	9	13	7	9	8	61.54	3
0630	Pharmacy Consumables	51	13	7	8	7.5	57.69	4
0631	Shock Surgical Team/Triage Equipment	61	11	23	16	19.5	177.27	12
0632	Shock Surgical/Triage Consumables	141	12	22	16	19	158.33	11
0633	Acute Care Ward Equipment	38	9	12	9	10.5	116.67	6
0634	Acute Care Ward Consumables	88	9	12	9	10.5	116.67	5
0635	Aid Station Equipment	73	35	16	15	15.5	44.29	7
0636	Aid Station Consumables	180	40	27	21	24	60.00	13
0637	Preventive Medicine Equipment	139	1	0	0	0	0.00	0
0638	Preventive Medicine Consumables	93	1	0	0	0	0.00	0
0639	Operating Room Equipment	144	9	8	8	8	88.89	4
0640	Operating Room Consumables	157	9	8	7	7.5	83.33	5
0649	X-ray Consumables	13	13	7	7	7	53.85	3
0662	Field Dental Operatory	325	26	33	22	27.5	105.77	15
0684	Medical Logistics Mission/Geographic	1	0	0	0	0	0.00	0
0685	Medical Logistics Mission/Geographic	8	0	0	0	0	0.00	0
0686	Medical Logistics Mission/Geographic	15	0	0	0	0	0.00	0
0687	Medical Logistics Mission/Geographic	5	0	0	0	0	0.00	0
0688	Medical Logistics Mission/Geographic	10	0	0	0	0	0.00	0
0691	Medical Logistics Equipment Test & Repair Equipment	82	3	0	0	0	0.00	0
0692	Medical Logistics Equipment Test & Repair Consumables	222	3	0	0	0	0.00	0

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